Improving Information Management for Practical Solutions at WSDOT

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Knowledge Management Services

Improving Information Management for Practical Solutions at WSDOT

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Improving Information Management for Practical Solutions at WSDOT

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16. Abstract

This document presents objectives and recommendations for improvements to information and data management at Washington State Department of Transportation (WSDOT). Common information needs were identified based on the resource models. The current state of information management was assessed based on structured interviews with WSDOT information managers. These interviews were used to identify gaps in current practice and formulate recommendations for improvement..

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1. INTRODUCTION

This report is one of a series of products developed in support of WSDOT's Accelerated Innovation Deployment (AID) project, "*Deploying Practical Solutions with Lean Techniques and Knowledge Management"* (PS AID Project.) The Practical Solutions lifecycle (shown in Figure 1) represents a future vision for an integrated, performance-driven, multi-modal, multi-solution approach to addressing transportation goals.

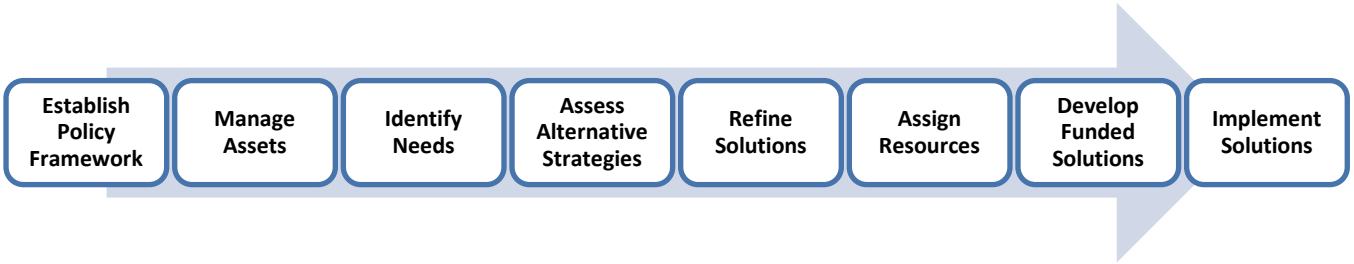


Figure 1 Practical Solutions Lifecycle

The Practical Solutions Lifecycle includes management and development of the multimodal transportation system. This vision is being realized through adjustments to workflows, and increased collaboration across and within WSDOT business units and with external partners. It is happening at a time when WSDOT and other DOTs across the country are responding to changes in federal reporting requirements and an increasing emphasis on performance management and transparency. These changes are creating new needs to share information across WSDOT business units, and with external partners and stakeholders. Therefore, it is an opportune time to examine information management practices at WSDOT with the goal of making reliable information available to people who need it, when they need it, in a convenient form.

WSDOT maintains over 370 IT applications including those providing information access and analysis capabilities to end users.[1] Roughly 60% (231) support one or more stages of the Practical Solutions lifecycle; 40% provide administrative functions that are cross-cutting in nature (e.g. financial, human resources, and information management). Figure 2 shows how the 231 applications supporting the Practical Solutions lifecycle are distributed across each of the stages. Note that many applications support more than one stage so may be counted several times in this distribution.

While the IT applications are highly diversified, much of the content in those systems has value across the lifecycle. WSDOT uses a Business Intelligence (BI) environment to facilitate connections between information systems in support of repetitive business needs. The diversified nature of WSDOT's IT applications makes data integration labor intensive. The demand for BI solutions has increased approximately 10% each year for the last seven years and every solution created must be maintained for the life of the business need. The diversified environment also increases the risk of duplicate data collection, questions about authoritative sources, and the potential for decisions to be based different but related sources.

[1] This figure is an estimate based on WSDOT's 2016 application inventory. It excludes internal system utilities and applications slated for retirement.

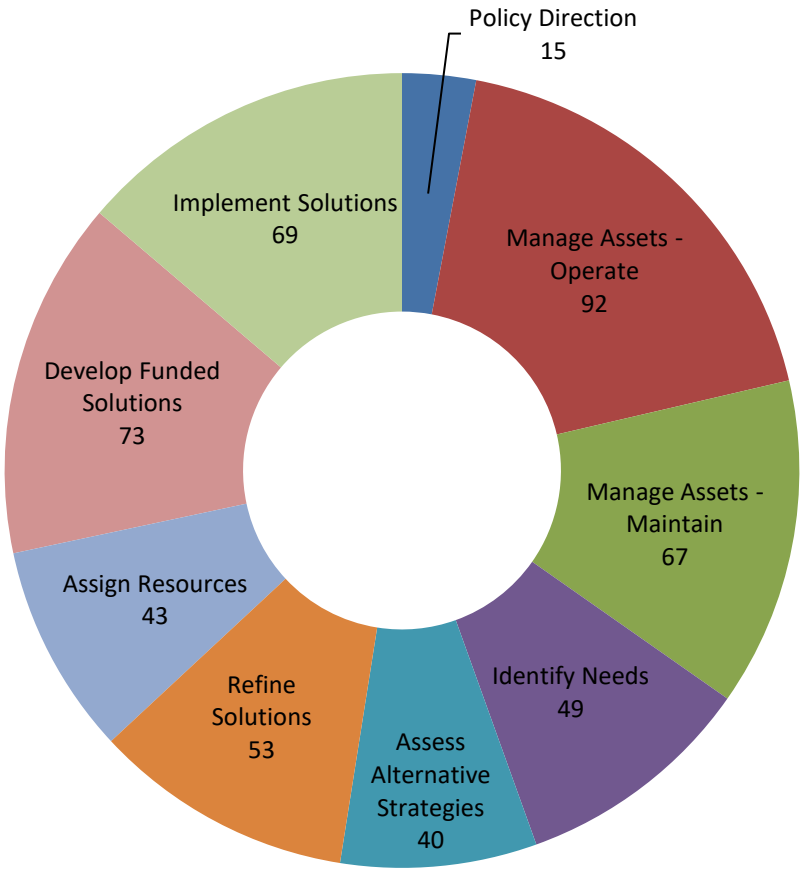


Figure 2. WSDOT Applications by Practical Solutions Lifecycle Stage

While WSDOT has made steady progress over the past decade in improving information management and access, additional work is needed to more fully meet the needs of a more integrated, performance-driven approach to transportation management and development.

This report presents recommendations for improvements to information management based on:

1. An analysis of common information needs across the Practical Solutions Lifecycle – to identify the types of shared information resources that would be beneficial to provide, and
2. Interviews with key staff responsible for agency information management functions – to identify gaps in current capabilities to support convenient access to a common, trusted pool of information resources.

The recommendations are comprehensive. They are intended to provide a foundation for setting priorities and allocating resources for an ongoing program of improvements.

The remainder of this report is organized as follows:

- Section 2 presents the recommendations.
- Section 3 reviews the analysis of common information needs to support the Practical Solutions lifecycle.
- Section 4 summarizes the results of interviews with WSDOT information management staff.

- Appendix A identifies available resources that WSDOT can use to build an information architecture that supports the Practical Solutions lifecycle.
- Appendix B reviews prior work at WSDOT on information management – which provided a foundation for this current effort.
- Appendices C and D present detailed results of the interviews summarized in section 4.

2. Supporting Practical Solutions Through Information Management

This section presents objectives and recommendations for improving information management to support Practical Solutions. It also discusses key ingredients that will be necessary to implement these recommendations and accomplish sustained improvements to information management capabilities.

Objectives and Recommendations

The Practical Solutions approach requires a greater level of collaboration and information sharing across functional areas of the Department. Standardization in information collection, access, and compilation will build confidence in existing information resources, help WSDOT to maximize use of its limited budget and staff capacity, and provide a foundation for agility. Given continued evolution of the Practical Solutions approach (and continued developments in technology), more agility on the part of WSDOTs information management functions will be required to respond to changing needs and enable business users to leverage available information resources in different ways, support integration and feedback, and facilitate learning and innovation. Therefore, recommendations for improved information management are aimed at achieving the following objectives:

1. Build and maintain a common pool of information needed by people across the Department engaged in the Practical Solutions life cycle;
2. Maximize use of available information resources;
3. Provide the agility needed to respond to a changing environment by minimizing the time required to maintain connections between diversified systems so IT staff can address emergent needs more quickly; and
4. Facilitate learning and collaboration.

Objective 1: Build and Maintain a Common Pool of Information

WSDOT employees need access to a common pool of authoritative information resources from a variety of internal and external sources supporting:

- Understanding of agency policy and guidance;
- Understanding of transportation system context, performance and needs;
- Understanding of available solutions and their likely costs and effectiveness; and
- Engagement and collaboration.

Some of this common pool of information is in place today at WSDOT – for example, some data are shared via the GIS Workbench and Data Warehouse, and agency manuals are available on the Publication Services web site. There is room for improvement, however, to broaden access to information through shared tools, and to govern that information to ensure consistency, currency and quality.

Building and maintaining a common pool of information supporting Practical Solutions involves continued efforts to identify and prioritize information resources to be made available and shared. The list of common information needs summarized in Section 3 provide a starting point for further refinement.

Investing in Information Priorities

Similar to the Practical Solutions lifecycle, the process for identifying information investments should establish a performance framework, consider performance of existing information resources, identify needs, consider alternative strategies, and prioritize investments. These improvements may include new information acquisition or development guided by an understanding of common needs, new or modified information access and reporting capabilities, and automated integration of information across source systems.

Recommendations:

1.1 WSDOT should formally adopt a data business plan for Practical Solutions that establishes a performance framework and identifies the needs for data and information sharing, integration, and feedback loops.

1.2 WSDOT should formally recognize the importance of building a common pool of information by designating roles responsible for coordinating shared resources and a process for improvements.

1.3 WSDOT should establish a listing or catalog of shared information assets – starting with existing information resources that are made available through the WSDOT Library, enterprise GIS, data warehouse, websites, content management systems, or other enterprise repositories.

1.4 WSDOT should review the catalog of shared information assets and identify potential overlaps, conflicts, and gaps that would improve these information resources needed to support the Practical Solutions Lifecycle.

1.5 WSDOT should establish a process for prioritizing information improvements to build the portfolio of shared information assets and enhance its value. Similar to the Practical Solutions lifecycle, the process for identifying information investments should establish a performance framework, consider performance of existing information resources, identify needs, consider alternative strategies, and prioritize investments. These improvements may include new information acquisition or development guided by an understanding of common needs, new or modified information access and reporting capabilities, and automated integration of information across source systems.

1.6 WSDOT should build on existing enterprise information access tools – including GIS, the data warehouse, the WSDOT Library, business intelligence/reporting tools, and content management systems to expand the pool of accessible information. These efforts should consider creating a common access point for information about various transportation assets.

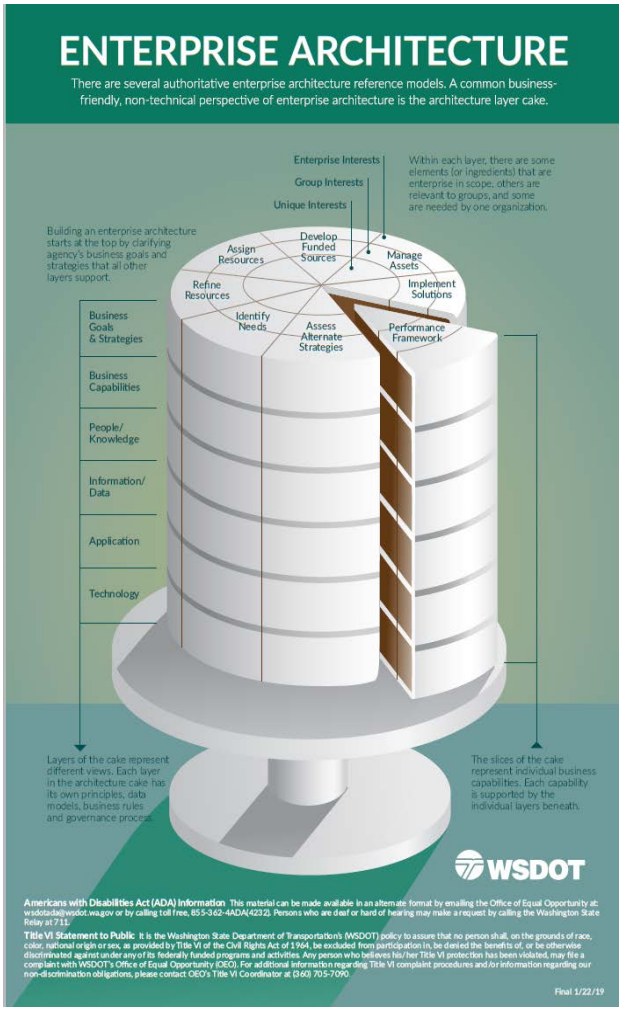
OBJECTIVE 2: MAXIMIZE USE OF AVAILABLE INFORMATION RESOURCES

WSDOT needs to stretch its available budget and staff resources by maximizing use of available information. Each data set that is collected; each report that is compiled; each map that is created represents an investment in staff time. This investment should be maximized by making sure that information created can be found and re-used. Achieving this objective requires three strategies: (1) **Leveraging information** produced by one business function for use in other business functions, (2) Ensuring **confidence and trust** in available information resources, and (3) Improving **discovery of and access** to relevant information.

The first strategy concerns leveraging information produced through one business function for use in others – or designing information gathering activities to meet needs of multiple business functions. This requires a shared vision of desired information flows and a cross-divisional commitment to collaborating on improvements that meet collective needs.

The second strategy concerns ensuring trust and confidence in available information resources. This requires improvements to version management so that authoritative versions of information resources are identified and older versions are archived or discarded. Version management must be applied with appropriate consistency through records management, library management, data management, web content management and archiving procedures and responsibilities. Throughout these processes, there must be attention to ensuring that decisions about what to keep, what to discard and what to archive are aligned with enterprise business needs.

The third strategy involves improving discovery and access to relevant data and information. This requires a sustained information architecture function. Information architecture is an integral part of a broader enterprise architecture function that also includes business, knowledge, application and technology layers (Figure X). The discovery and access strategy: (1) builds an understanding of information access needs, (2) creates a coherent vision for building blocks to meet these needs (including, for example, core metadata standards, metadata repositories, a thesaurus, search technologies, and knowledge organization systems), (3) clarifies what information resources to put where, (4) clarifies organizational responsibilities for contributing works to designated repositories, and (5) oversees a process to realize the vision over time based on a road map defining a logical and coordinated order of implementation. A companion report produced as part of the PS AID project: "Information Architecture High Level Overview" provides further detail on information architecture. This report also includes an assessment of the status of various information architecture components at WSDOT – indicating opportunities for further advancement in practices.



Recommendations:

2.1 WSDOT should continue work on solutions that leverage information and facilitate feedback loops across the Practical Solutions lifecycle. Specific opportunities include (1) updates to asset inventory and work history information from design plans, as-builts, and construction project management information and (2) improving access to Corridor Sketch products and information for use by other functional areas.

2.2 WSDOT should continue to implement processes for documenting and passing along information about performance, needs, analysis, decisions and results across the transportation development life cycle.

2.3 WSDOT should ensure use of established data standards in order to facilitate discovery and integration across information resources. For example, standards for geographic location and project identification could enhance and expedite integration of corridor data.

2.4 WSDOT should pursue development of an agency-wide glossary and thesaurus that includes commonly used synonyms and other term relationships for key terms. This will facilitate keyword searches for information by people from different disciplines, functions, and time periods and also improve the relevance of search returns.

2.5 WSDOT should strengthen information stewardship processes for establishing update schedules that align with business needs and ensure clear documentation of information derivation and limitations.

2.6 WSDOT should strengthen use of version management and records management practices through continued employee training and improvements to available content management and archiving tools. A specific opportunity is to enable synchronization of content across devices to support employees who work remotely.

2.7 WSDOT should designate a lead for enterprise architecture and identify functional (e.g., engineering, planning) and subject (e.g., safety, mobility) domain responsibilities. The enterprise architecture lead should convene a group to establish enterprise architecture goals and a top-level business function classification scheme, review the status of information architecture components at WSDOT, identify priorities for advancement, and build a road map and domain responsibilities for work to be conducted over the next 3 years. A sample work program for standing up an information architecture function at

2.8 WSDOT is shown in the box below. Appendix A identifies current Information Architecture resources at WSDOT and potential next steps for the functional domain of Information Management. These can be used as a starting point for building a roadmap.

Sample Work Plan for Standing Up an Information Architecture Function

1. Create an enterprise architecture team and establish goals and a business function classification that will drive information investments.
2. Identify business processes that drive the need for information management improvements (building on the resource models developed for Practical Solutions lifecycle stages) and establish functional domains and organizational responsibilities for the domains.
3. Work with appropriate domain representatives to develop a common vision for domain information resources and identify improvement needs. As appropriate, include descriptions of use case scenarios to illustrate how business users would benefit from improvements.
4. Prioritize information investments within and between domains based on an assessment of current state and relative importance to the enterprise architecture.
5. Establish resources and working groups for each domain/subdomain to create appropriate artifacts (which will vary by area)
6. Clarify information management roles and collaboration points for each service defined in the architecture – a RASCI model (or similar) can be used for this purpose.
7. Use the architecture work to inform development of a prioritized roadmap of strategies for improving information management capabilities.
8. Establish a training and communication function to maximize socialization of information management best practices in the agency.

OBJECTIVE 3: PROVIDE THE AGILITY NEEDED TO RESPOND TO A CHANGING ENVIRONMENT

Information needs, sources and solutions are continually changing. It is more important than ever to shift away from addressing information management needs through separate, single purpose systems that are not easy to adapt to new needs and require specialized IT staff resources to maintain. WSDOT currently has over 370 distinct applications (excluding those that are not managed by IT) and over 60 engineering publications that support the Practical Solutions lifecycle. Identifying opportunities to consolidate content and applications requires an enterprise perspective and an organizational commitment to working across divisions.

Recommendations:

3.1 WSDOT should undertake an effort to identify opportunities to eliminate and consolidate information and applications through integration and adoption of common tools for meeting similar functions.

3.2 WSDOT should continue to explore and implement “self-service” information access and analysis solutions for different types of users.

3.3 WSDOT should identify additional opportunities to pursue hosted and other software-as-a-service solutions that meet information sharing and analysis needs without requiring that the agency install and manage software.

3.4 WSDOT should assess training needs to improve use of information tools and resources and develop a roadmap for implementation of identified improvements. The speed of technology change increases the demand for training for information technology and management staff as well as information users. A better understanding of training needs and challenges and opportunities for improvement is needed.

3.5 WSDOT should establish a 'skunkworks' program to provide a safe environment for testing new options. Skunkworks projects allow organizations to work outside the rules in a constrained setting to test new practices.

OBJECTIVE 4: FACILITATE COLLABORATION AND LEARNING

The Practical Solutions approach has been defined at a high level, and business processes are evolving. Fully realizing the vision for Practical Solutions will necessarily involve considerable collaboration and learning as people continue translating principles and concepts into practice. It will be important for successful practices and lessons learned to be disseminated to ensure a process of continual improvement. A companion report produced as part of the PS AID project: "Strengthening a Learning Culture for Practical Solutions" includes a broad set of recommendations for facilitating collaboration and learning. Those involving information management improvements are repeated here.

Recommendations:

4.1 Design a single "home base" for Practical Solutions learning resources, with links to:
- WSDOT Training Materials
- WSDOT Case Studies and Lessons Learned
- WSDOT Application Examples
- National and other State DOT resources
- Resource people
- Link to expertise directory (see 4.4)
- Link to discussion forum (see 4.3)

4.2 Develop a plan for collaboration support that considers remote meetings, file sharing (both internally and with external partners), and use of social media, listserves, etc. This plan should include a summary of business needs for collaboration, strategies to maximize capabilities and use of existing tools as well as potential development/acquisition of new tools.

4.3 Pilot an online discussion forum for Practical Solutions – involving active moderation to facilitate productive participation.

4.4 Pilot an online Expertise Directory supporting Practical Solutions – that enables individual employees to populate information about their areas of expertise and interests – use this effort to facilitate collaboration across a broad set of individuals.

4.5 Develop behavioral competencies and recognition practices for collaboration.

WSDOT'S PRACTICAL SOLUTIONS FOUNDATIONS: VISION & STRATEGY, DECISION MAKING, CULTURE, RESOURCES

Several recommendations were presented in the preceding section. Sustained and significant progress on these recommendations will require attention to four foundational ingredients: Vision and Strategy; Decision Making Structures and Processes; Culture; and Resources. These ingredients are defined below, along with an assessment of WSDOT's current state.

INGREDIENT #1: VISION AND STRATEGY

Definition

A clear vision and strategy for information management that is supported by agency leadership and each of the agency's information management functions. A sample vision for information management is shown in the box below.

Sample Vision for Improved Information Management

1. Information resources provide an efficient foundation for execution.
2. A common pool of authoritative agency information resources is available to employees.
3. Data are delivered in a variety of forms to maximize their value for decision making.
4. Consistent and up to date system asset and improvement project information is available for reporting through multiple channels.
5. Electronic engineering data (including CAD) are spatially enabled and shared across the asset development life cycle.
6. WSDOT supports internal collaboration and continuous improvement by providing convenient and secure online tools.
7. Effective search and navigation tools and reference services are available that enable employees to find relevant information in multiple agency repositories.
8. WSDOT's intranet and internet sites are easily navigable and provide relevant and current content.
9. WSDOT is efficiently complying with records management and public disclosure requirements.
10. WSDOT protects sensitive data and supports internal and external information access across a range of platforms (including mobile devices and cloud) through well-managed, convenient and secure user authorization and authentication services.
11. WSDOT's critical applications are reliable, resilient and take advantage of current technology.

Assessment

- There is agreement on high level information management principles, and progress has been made in several areas. However, there isn't yet a holistic, shared picture of what the desired end state is, and how to get there.
- There is interest in using social media tools to share information about expertise, resources, events, etc. but there is a lack of clarity about what social media tools are sanctioned and supported.
- Employees have multiple options for storing, managing and sharing information (ILINKS, ProjectWise, SharePoint, shared drives), but there isn't guidance on which system should be used for different types of content or for different purposes.

INGREDIENT #2: DECISION MAKING STRUCTURES AND PROCESSES

Definition

Information development and improvement decision making processes that are set up to identify, prioritize and address common data and information needs; facilitate coordination, efficiency and consistency across reporting systems and establish clear roles and responsibilities.

Assessment

- Prior efforts (described in Appendix B) recognized a gap in this area and recommended development of a standard data and information improvement process flow, showing where business contributes to the information technology initiative lifecycle.
- WSDOT's current data and information stewardship structure may be defined at too granular a level to provide coordination across business units. For example, there are multiple sources of project information (data mart, Beige Pages, project web sites, TEIS), which are not necessarily in sync, and may involve some duplication of effort for data preparation. Having several data and information access points geared to different audiences isn't a problem per se, but assigned responsibility and attention is needed to ensure that common data definitions are used across these points and that efforts to access and transform source data are coordinated and consistent.
- Information investments align with needs of individual business units but not with cross-cutting organizational needs. In addition, the process and timing for information investments don't align with emergent needs. As an example, development of Corridor Sketches was identified as a priority to help facilitate implementation of Practical Solutions. The need for an application to collect data and information about transportation corridors was identified during a biennium after the IT Division and Multimodal Planning Division resources were programmed. The office assigned responsibility developed a MS Access database to meet immediate needs and the corridor data was entered manually into this database, which quickly reached capacity. A second-generation GIS resource is being developed to meet the needs for Corridor Sketches. However, data access needs are likely to evolve in the future since some corridor data has applicability across the Practical Solutions lifecycle. The MS Access solution was an appropriate choice for the context but highlights a challenge in aligning information investments with organizational priorities in order to avoid rework and expedite delivery of information solutions.

INGREDIENT #3: INFORMATION MANAGEMENT CULTURE

Definition

Widespread understanding of the importance of information management, the value of information science, and adoption of best practices based on clearly articulated organizational expectations.

Assessment

- Staff understanding and application of good information management practices is uneven – and people are not willing or able to make the time necessary for content cleanup, documentation/tagging and organization tasks. Access to data and information resources is also uneven and does not necessarily align with knowledge needs. This has led to proliferation of non-authoritative, outdated and duplicative content on file servers, SharePoint sites and web sites that inhibit efficient information discovery and retrieval.
- Did information literacy come up in the interviews? If so, add it here.

INGREDIENT #4: RESOURCES

Definition

Information management staff with the right skills and bandwidth to proactively manage information resources for findability and access and to pursue improvements that benefit multiple business units.

Assessment

- WSDOT has a large and complex inventory of IT applications, with a backlog of critical system replacement/upgrade needs. IT staff focus on "keeping the lights on" and responding to urgent issues that arise.
- Communications has responsibility for WSDOTs internet and intranet, but an emphasis on external communications leaves only 0.5 of an FTE for the intranet site – which is in need of significant improvement.
- Records Management has responsibility for safeguarding WSDOT's records, documents, publications and records management process. Business units and employees are responsible for their part in carrying out records management, but compliance is "fair" at best. Resources are inadequate for tools and staff to address the existing backlog and deploy proactive records management practices.
- Library Collections – The WSDOT Library manages a collection of agency publications as well as resources used by business areas. WSDOT is required to submit agency publications to the Washington State Library but submittal by business units is limited. Resources are inadequate for training on expectations, monitoring collection of agency publications, and implementation of a digital collection.

These four ingredients are all interrelated – changes to resourcing won't happen without a clear vision and strategy; decision-making and stewardship structures are dependent on values and motivations inherent in an information management culture. Based on the interviews, WSDOT has a critical mass of individuals who are supportive of a holistic approach to information management; but further collaboration is needed to develop a shared vision and strategy with a compelling business case.

3. Common Information Needs to Support a Future Transportation Development Process

Resource Models

As part of WSDOT's PS AID project, a series of workshops was held in the summer and fall of 2015 to define a vision for a future business process for managing and developing the multimodal transportation system using the Practical Solutions approach. These workshops involved over 100 individuals across WSDOT. The products of the workshops included lists of Suppliers, Inputs, Products, Outputs and Customers (SIPOCs) for core agency functions (Goal Setting, Planning, Programming, Project Development, Construction, Maintenance and Operations.) They also included lists of issues and challenges to be addressed to operationalize the envisioned future business process.

The Practical Solutions process map identified eight stages for transportation management and development. These stages are illustrated in Figure 1 above.

The future state process map and materials created through the workshops were used to develop a set of **resource models** that identify knowledge and information needs associated with each step of the future state process. These resource models are presented in a separate deliverable. However, this document reviews relevant finding and conclusions about business needs for information management improvements to support Practical Solutions.

Implications for Information Management at WSDOT

The resource models define the major activities involved, the types of knowledge and information that are needed to perform these activities, and the information produced as a result of the activities. They also identify groups within WSDOT and external to WSDOT that need to be involved in each step in various capacities. One use of the resource models is to identify common information needs across the lifecycle stages. The resource models also identify opportunities for feedback loops to update information resources and products. An understanding of common information needs is essential for identifying information that should be part of a **shared knowledge base** at WSDOT. Information management strategies can then be identified to support this shared knowledge base.

Figure 3 illustrates an interaction matrix to highlight common information needs across the transportation development life cycle:

- Columns of the matrix represent the eight stages in the Practical Solutions transportation development business process
- Rows of the matrix represent high level categories of data, information and knowledge that are inputs to the transportation development lifecycle stages.

Figure 3 illustrates several areas of commonality across the lifecycle. For example, all the eight stages make use of information on:

- System Condition and Performance
- Demand/Utilization/Travel
- Stakeholder Concerns and Priorities and
- Laws, Regulations and Policies.

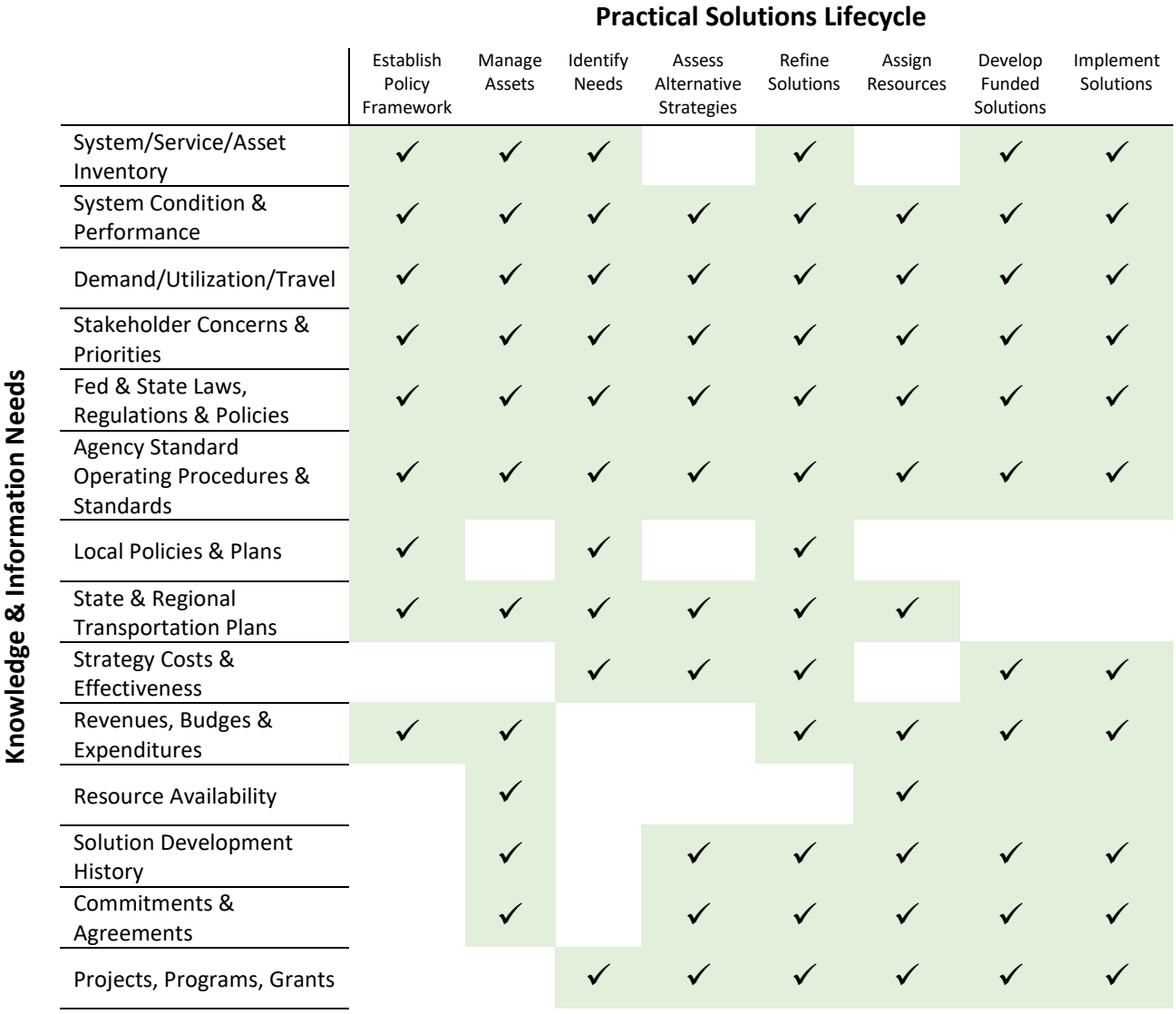


Figure 3. Interaction Matrix: Common Knowledge and Information Needs across Process Steps

This interaction matrix – and the resource models behind it - can be used to guide strategies supporting the objectives and recommendations for improving information management that were presented in Section 2:

- **Objective 1: Build and Maintain a Common Pool of Information -** The information categories (rows in the interaction matrix) provide a framework for identifying information resources to include in the common pool of information.
- **Objective 2: Maximize Use of Available Information Resources –** The analysis of information needs across the lifecycle can be used to identify opportunities for leveraging information produced through one business function for use in others – for example, documenting commitments made in the initial stages in a form that can be used in later stages to check whether these commitments were honored. The understanding of common needs can also be used to suggest information gathering and development activities that would reduce inefficient use of limited resources.
- **Objective 3: Provide the Agility Needed to Respond to a Changing Environment -** The resource models identify applications that support each of the lifecycle stages. This information can be used to identify

opportunities to consolidate applications to reduce the maintenance burden and move to a more flexible approach.

- **Objective 4: Facilitate Collaboration and Learning –** The resource models identify information and knowledge needs at each lifecycle stage as well as actors and their roles. This information can be used to suggest focus areas for increased collaboration.

Development of the resource models suggested several steps that would be beneficial to support information needs of the Practical Solutions life cycle. These steps were used to formulate the objectives and recommendations presented in Section 2.

1. **Holistically assess data and information gaps and sources.** Under Practical Solutions, the need for system improvement is triggered when performance falls below goals. Contextual needs are considered to formulate strategies and evaluate appropriate solutions. For example, as can be seen on the interaction matrix, inputs to the *Identify Needs* and *Assess Alternative Strategies* stage include information about transportation supply, demand/utilization, condition and performance. While performance measures and targets have not yet been established in all areas (and therefore specific gaps cannot be enumerated), **some of the information that would be helpful to understand need and context is not currently available or easily accessible.** Some data may be required in only one area while other data may be valuable across the whole lifecycle. It would be beneficial to establish a shared vision for the information resources to support the Practical Solutions lifecycle including potential source conflicts and gaps.
2. **Establish practices for evaluating information investments**. There are ongoing discussions about tradeoffs between the likely costs of acquiring new data versus the value to be added. Even where data exist, it may be older since some data collection efforts are pursued on a one-time or irregular periodic basis while business information needs are ongoing. In addition, sometimes data are collected with different standards complicating integration for easy access. Given the high costs of data collection and management, and availability of new data sources and collection technologies, WSDOT needs a robust process for evaluating new data acquisition options and integrating new data with existing data resources and systems.
3. **Enable information discovery and access based on location.** Improved access to a variety of available information related to a specific location is needed across the lifecycle. This requires assignment of standard spatial referencing as well as improvements to spatial discovery and access tools.
4. **Improve the flow of information across the lifecycle**. Improving connections between transportation development phases could involve ensuring complete documentation of, access to the solution development history, and packaging of information produced in one phase in a form that is needed by the subsequent phase (for example, creation of asset owner's manuals in construction for use in maintenance and operations.)
5. **Re-use data and information across the lifecycle.** There are few feedback loops established between functional areas and information resources. Feedback loops provide an opportunity to optimize the use of data and information and also promote continual improvement. For example, information produced during design and construction could be made available for future maintenance, operations and improvement processes. As-built plans would be helpful for maintenance staff for investigating drainage issues. Feedback from *Refining Solutions* could improve strategy development.

6. **Preserve and communicate lessons learned and process changes**. New processes and methods related to Practical Solutions need to be disseminated, including lessons learned about strategy cost and effectiveness as experience is gained with the application of new processes and methods.

4. Information Management Interviews

A series of interviews were conducted to provide WSDOT information management staff perspectives in two areas: (1) current successes and future opportunities for meeting the information management needs associated with Practical Solutions (as presented in the prior section), and (2) current information management practices and improvement needs. Prior to the interviews, several background documents were reviewed, including prior summaries of information management practices, concerns and needs at WSDOT. A summary of this review is provided in Appendix B.

The following groups and individuals were interviewed:

1. Information Technology: Grant Rodeheaver, Larry Gruginski, Tom Westfall
2. Enterprise Data Management: Michelle Blake, Gordon Kennedy, Leni Oman
3. Records Management: Kara Larsen and Jamey Taylor
4. Geospatial Data Management/GIS: Mark Finch and Alan Smith
5. Library: Kathy Szolomayer and Christy Granquist, Leni Oman
6. Communications: Kris Rietmann and Jeremy Bertrand
7. Computer-Aided Engineering (CAE) Support: Clint Hill
8. Asset Management: Mitzi Frick

An interview guide was prepared and distributed to each participant in advance. Part I of the guide included questions about information needs to support Practical Solutions. Part II of the guide included questions pertaining to a set of standard information management practices. Summaries of interview findings for each part of the questionnaire are presented below; detailed responses are included in Appendices B and C.

Information Needs to Support Practical Solutions

This part of the interview included the following questions:

1. **Making Better Use of Information & Deciding on New Collection.** Transportation system development using Practical Solutions approaches may require additional data and information (e.g. to better understand need and context).
    a. How do you think WSDOT could make better use of *existing* data and information? (Identify specific examples where information may be re-created or not re-used as much as it could)
    b. Do you feel that WSDOT has the processes in place to make good decisions about collecting *new* data - for example: making the business case, assessing readiness to store/process/distribute, determining source system and integration needs, allocating resources? If not, what steps are needed to improve these decision-making processes?
2. **Data Sharing.** Under Practical Solutions, there is a greater need to share information about system conditions, needs and proposed strategies across different WSDOT Divisions.
    a. What examples are you aware of where data have been shared across WSDOT business units? What do you think has been the most successful effort at WSDOT to *improve* access to information across different Divisions?

b. What do you think is most important to tackle next to facilitate cross-divisional information sharing?

3. **Capturing and Sharing Lessons.** As WSDOT gains experience with implementing Practical Solutions approaches it will be important to document and disseminate successful techniques and lessons learned.
    a. How can WSDOT best support and sustain development and dissemination of lessons learned related to Practical Solutions?
    b. What is the role of information technologies for communication and collaboration here - how can tools such as wikis, SharePoint team sites, Yammer, etc. be better leveraged?
4. **Integrating Data across the Transportation Development Lifecycle.** Like many other DOTs, there is interest at WSDOT about sharing information about assets across their life cycle – from design through operations.
    a. Do you see a need for improving access to design plans, as-builts and right of way plans after a project is complete – e.g. for maintenance and operations staff or for informing future work at that location? What is your vision for how this might improve over the next five years?
    b. Do you see a need for improving how information about asset performance is communicated from maintenance and operations functions to design and construction? How might this flow of information be improved in the future?

Responses to each of these questions are synthesized below.

1. Making Better Use of Information & Deciding on New Collection

Coordinated and Holistic Approach. The need for a more enterprise-wide approach to ensure that existing data is fully leveraged was a common theme among interview respondents. While WSDOT has several enterprise-wide sources of information (GIS, data warehouse, HATS), respondents generally recognized that there are many opportunities for making better use of already existing information at WSDOT, and for improving coordination across business units on new data collection efforts. A recent Asset Management self-assessment raised awareness of the need for a more coordinated approach to asset data collection and management.

Leveraging Design Information. Extracting information from CAD drawings is seen as an important opportunity for repurposing existing information. For example, information about new assets installed as part of a construction project could be extracted from the design drawing and used to populate asset inventories, reducing the need to collect new data (or the level of effort required for new asset data collection.) The GIS Connector effort represents an important step in this area – this tool provides the capability to take CAD elements and make them "intelligent" – i.e. assign a spatial location and business attributes to them. Additional work to integrate CAD data extraction capabilities in support of specific workflows is needed (for example, for environmental, real estate, traffic design, etc.)

Leveraging Imaging Technology to Reduce Field Data Collection. There has been some discussion about use of mobile LiDAR in conjunction with the agency's video log process (which provides imagery for the entire state highway system, refreshed on a two-year cycle.) LiDAR data could allow business areas to capture data on vertical clearances, signage, guardrail, etc. to update inventory data without additional, special purpose field data collection.

Guidance on When to Collect or Re-Collect Data. Some of the interview respondents noted that there may be a tendency to collect new data even when similar data is already available. Sometimes there are legitimate reasons for this – data may be too old to represent current conditions, accuracy may not be sufficient; or key data elements may not be present. In other cases, the data may in fact be "good enough", but individuals still feel that there is risk in relying on older data that they did not collect themselves. These observations point to the potential need for additional guidance on when investments in new data are warranted.

Improved Access to Existing Data. Some respondents viewed further improvements to data integration and access as the key to enabling better use of existing data. For example, the current corridor sketch application provides a tool that brings together information about existing conditions and needs, but it is difficult to sustain in its current platform and work on data governance and data integration is needed to ensure availability of current and valid data in a useful form. A configurable GIS-based tool that leverages a wide range of data resources and is supported by a process of automated data updates could serve multiple business needs across the Department. Initial steps in this direction are being taken, though a comprehensive solution is not currently resourced.

Improved Information Management Practices. Finally, some respondents pointed to the need for improved information management practices to facilitate information re-use. Clear guidelines about what information should be stored where could make it easier for staff to discover available information. Improved version management could remove one of the existing impediments to information re-use. Storage of multiple copies of a given file makes it difficult to determine what the correct or authoritative version is. More disciplined information management practices, implementation of digital signatures and increased use of ECM tools with version control features are strategies available to make progress in this area.

2. DATA SHARING

Not surprisingly, discussions about data sharing across divisions surfaced issues and solutions that were similar in nature to those discussed under information re-use. In general, respondents talked about the need to gain a *better understanding of business needs* for data sharing, and for development of *enterprise solutions* based on holistic planning and collaboration across business units.

Several specific examples were identified of existing systems for sharing information across divisions. These include:

- The WSDOT Data Warehouse – providing data marts for financial information, labor (payroll), roadway, traffic, crashes, construction, program management, facilities, consumables, and WSF fares
- The Transportation Executive Information System (TEIS) providing a central source for financial, project, and performance data for the Legislative Transportation Committees (HTC, STC), the Office of Financial Management (OFM), transportation agency managers, and other state agencies
- The Financial Information Retrieval System (FIRS), providing access to summarized accounting, spending plan, and work order information from the Transportation Reporting Accounting and Information System (TRAINS) and its budget subsystem (TRACS)
- Enterprise Content Management (ECM) applications, accessible via a common front end (the ECM Portal), and leveraging storage and service components of WSDOT's enterprise ECM solution as appropriate to meet business needs

- GIS applications including the GIS Workbench, Geoportals, and ArcGIS Online (which includes the Vertical Clearance Application)
- Library Daily News Clips
- Agency Twitter Feed

Suggested improvements to cross-divisional information sharing included:

- Improvements to consistency of project information reporting. There are several different project information repositories (data marts, project web sites, CPDM, Beige Pages, TEIS), which can lead to challenges interpreting differences across sources.
- Integrated asset data reporting. Currently information for each asset is maintained in a separate system, definitions of assets vary (e.g., Keller Ferry is described as a ferry and a structure in different systems), and there is no easy way to provide a consolidated view of asset inventory, condition, needs, or planned work.
- Build on existing capabilities – improve GIS data access for casual users; provide more seamless integration between GIS and the Data Warehouse.
- Build a portal to facilitate data sharing with local partners.
- Leverage cloud-based services for data sharing.

3. Capturing and Sharing Lessons

Several methods for capturing and sharing lessons learned have been used at WSDOT:

- Lessons Learned Repository web site – highway construction focused; no longer in active use
- WSF Risk management database with lessons learned for every incident
- After Action Reviews (AARs) – a practice that has been discontinued (though knowledge interviews found that there is interest in bringing this back)
- WSDOT Library staff field questions about best practices and lessons
- Lean office activities, which include regular report-outs
- SharePoint team sites (though these need guidance and management to maximize effectiveness)
- Yammer

People generally recognize the value of sharing past experience in order to improve future practice, and that there are opportunities to leverage a range of tools, including social media tools for this purpose. However, several barriers were identified:

- Lessons learned repositories require dedicated staff time to be sustainable; and are ideally supported by communities of practice to vet/validate lessons;
- There isn't a deliberate strategy articulated about capturing lessons learned – when, why, or how;
- There isn't a deliberate strategy articulated about how to encourage or facilitate use of lessons learned;
- There are concerns that documenting a lesson learned may create a risk if it points to an action that should have been taken but was not;
- There is a lack of understanding about records retention requirements associated with communication of lessons;
- There is a lack of clarity about what tools should be used for sharing this kind of information;

- There is a lack of clarity about which social media tools are sanctioned for use;
- There isn't an established process involving business participants for piloting use of social media tools in order to assess their value.

In addition to the need for more deliberate strategies and tools for capturing and sharing lessons learned, WSDOT can also consider development of expertise directories and support for communities of practice to facilitate person-to-person sharing of lessons and collaborative problem solving.

4. Integrating Data across the Transportation Development Lifecycle

Several activities are underway to share data across the transportation development life cycle at WSDOT. Asset stewards at WSDOT currently use as-built plans to update asset inventory – these are a valuable source of information, particularly on underground items that can't be gathered through field observation. As noted above, continued implementation of the GIS Connector tool in ProjectWise can facilitate how information developed during design can be made available during construction, maintenance and operations.

Cross-functional coordination and communication mechanisms are important for gaining a common understanding of opportunities and solutions. The Highway Asset Management Technical Advisory Group (HAMTAG) is an example of a group that is facilitating communication between asset stewards and Maintenance Operations functions of the Department. Efforts at WSDOT and other DOTs to move towards paperless construction are likely to offer further opportunities for sharing information across the life cycle; closer collaboration across different business units will be critical to develop a shared vision as this occurs.

Opportunities for further development of capabilities in this area include:

- Making information about asset work history available to designers so that they can better understand performance of different materials and design choices;
- Automating updates to the highway log based on contract plan sets;
- Automating updates to asset inventories based on contract plan sets.

There is also some potential to re-use existing as-built plans as the starting point for a new project in the same location (i.e. rather than re-surveying), but further discussion would be necessary as to the conditions under which this would be feasible and desirable.

Information Management Improvement Needs and Priorities

This second part of the interview walked through different types of information management functions and asked respondents about:

- What is WSDOT currently doing?
- What improvements are needed?
- What so you see as the priority next steps – which are most important for success of Practical Solutions?

Six categories of information management functions were identified using (1) an enterprise architecture model developed by the International Monetary Fund (IMF), and (2) a reference model for content and records management included in the 2006 report titled: "ANSI / AIIM / ARMA TR 48-2006 – Technical Report – Revised Framework for Integration of EDMS/ERMS." The elements of this model were tailored for WSDOT. The six areas were:

1. **Information and Records Management Policy, Standards and Guidelines and Governance** – functions for developing policies and standards for how information is managed at WSDOT – and the governance, training and support to make sure these are followed.
2. **Information/Records Creation, Access and Use Management** – day to day operational functions related to records management, data security and access management, and workflow management.
3. **Data Integration and Reporting Services** – functions for combining data from different sources for visualization, reporting and analysis. Primarily focused on structured data but may also involve integration of unstructured content (e.g. providing access to design or as-built plans via a map interface)
4. **Information Findability and Dissemination** – functions for enabling users to discover and learn about available data and information.
5. **Metadata and Semantics** – functions for creating and managing metadata schemes and controlled vocabularies, assigning metadata attributes (including classifications) to content, and designating and managing master and reference data.
6. **Business User Content Creation and Updating** – functions carried out by business users (rather than information managers) to create, update, and manage content. These functions are guided by established policies and standards and supported by available content management systems.

1. Information and Records Management Policy, Standards and Guidelines and Governance

Current State

WSDOT had an executive-level Enterprise Information Governance Group (EIGG) with responsibility for data and information repositories, processes, business needs and technology and applications. There was also an Enterprise Information Management Team (EIMT) is comprised of mid-level managers who support EIGG members as well as representatives from additional business areas. The agency has adopted a set of data and information principles, and has defined and assigned three data stewardship roles: Operational Data Stewards (subject matter experts responsible for describing data meaning and maintaining data quality), Managerial Data Stewards (business process owners or business managers accountable for the integrity of the data processes performed under their direction), and Executive Data Stewards (senior managers who establish policies and performance measures related to information quality, management and use.) Several policies and standards are in place including:

- Data management standard practices,
- Electronic information management
- E-Discovery
- Public disclosure
- Use of electronic/digital signatures
- Use of social media
- EIGG roles and responsibilities
- Organization names
- State route mileposts
- Electronic Engineering Data Standards (for preparing, delivering, and archiving electronic engineering data created for WSDOT during survey, design, and PS&E phases of highway projects.)
- Information technology security
- Records management policies (governed by the Revised Code of Washington); WSDOT records retention schedules

In addition, WSDOT utilizes available industry best practices, including the Data Management Body of Knowledge (DMBoK) and the Information Technology Infrastructure Library (ITIL).

A standard process is in place for evaluation and prioritization of new IT initiatives.

WSDOT employees are required to complete annual IT security training. Records management training was underway at the time of the interviews.

The EIGG and EIMT were suspended in 2016 as an updated structure for an Information Governance was developed. The new structure has not been implemented.

Improvement Needs

Many areas for improvement were identified in the interviews. Key themes were:

- **Vision –** Develop a more unified agency vision for information management based on understanding of the value of a coordinated enterprise approach.
- **Resourcing -** Adjust agency resourcing based on anticipated value to be gained (as well as risk of inaction, and clear picture of the path forward.
- **Guidance and Training** – Review, update and consolidate current information management policies and guidance materials and increase their level of understanding and application – through improved packaging, communication and training. Include guidance on expectations for where different types of content should be stored, and for version control and management.
- **Governance -** Clarify and strengthen the role of EIGG so that they are empowered to operationalize information governance; Track progress based on established outcome measures.

2. Information/Records Creation, Access and Use Management

Current State

Records management is working with WSDOT business units to review business processes and revise (as needed) records retention schedules and file plans. Records management training is also being conducted to ensure employee understanding of requirements, principles and expectations.

Policies and procedures are in place for management of access to structured data resources – WSDOT utilizes data security classifications established by the Washington State OCIO. Access is granted based on permissions assigned to roles established via active directory; business leads determine access rights based on need. WSDOT uses an identity management system to provide access to external users (e.g. contractors.)

ECM applications are configured for specific business functions; some include workflow services to manage content creation, sharing and access. Workflows are incorporated into selected other applications (e.g. accounting system.)

Improvement Needs

Greatest needs in this area are for improved management of unstructured data (documents, stand-alone files stored on file drives, emails) to (1) facilitate compliance with records retention schedules, (2) improve WSDOT's ability to locate information to respond to public disclosure requests, (3) ensure adequate protection of sensitive information, and (4) enhance findability of information to meet WSDOT business needs. Greater use of ECM that supports records management requirements is part of the solution. Other strategies include improvements to email archiving and search capabilities; implementation of consistent information labelling/classification schemes, and increased auditing of files posted on shared drives to ensure that they don't include sensitive information.

In addition to improving management of unstructured data, there is a need to review and adjust information access management practices to:

- reduce barriers to meeting business needs and open data goals while ensuring proper protection of sensitive information; and
- Improve identity management in order to more easily provide and manage information access for other entities (FHWA, partner agencies, contractors, etc.)

Finally, it would be beneficial to review opportunities for better leveraging workflow management capabilities beyond the current ECM applications. One comment from the interviews was that it is currently difficult to see the full picture of workflow with respect to data, records and information management, making it difficult to synchronize related activities. A dashboard view that provides visibility into what is in the pipeline, and what the status of different activities are could be helpful.

3. Data Integration and Reporting Services

Current State

WSDOT has a well-established data warehouse with data marts covering multiple subject areas including Crashes, Construction, Consumable Inventory, Facilities, Fares (ferries), Financial (accounting & budget), Labor, Program Management, Roadway and Traffic. Data marts provide a common source of authoritative data, and are used primarily for operational reporting via COGNOS. Three portals – for crash data, construction data, and traffic data publish data from the warehouse for external (public) consumption.

Several GIS applications offer an integrated view of spatially referenced data – the GIS Workbench is available in the desktop ArcGIS environment, and is geared towards skilled GIS users. A geoportal is available providing basic data display capabilities for more casual users. In addition, ArcGIS Online (externally accessible) applications have been developed, including a Vertical Clearance app providing information pertaining to

routing of oversized loads, and a Community Planning portal. WSDOT Information Technology maintains a Geodata Distribution Catalog providing a centralized distribution site for GIS data produced at WSDOT.

WSDOT has made limited use of a COGNOS Plugin tool that provides limited integration between GIS and information from the data warehouse.

At the time of the interviews, WSDOT was in the final stages of implementing a GIS Connector tool, which enables CAD to GIS integration. This effort involves extraction of CAD features and associated attributes to a geodatabase, and creation of "regional data maps", which are CAD files that combine information from multiple construction projects. GIS workbench users will be able to connect to the regional data maps as well as the geodatabase with the extracted features.

Improvement Needs

Improvement needs identified for the data warehouse include creating a more resilient environment through increased hardware redundancy and adding staff capacity needed to advance Business Intelligence (BI) and analytics capabilities. There is also a strong interest in building a greater level of integration between GIS and the data warehouse.

SharePoint includes BI/dashboard features and some users have expressed interest in these; there is a need to clarify whether WSDOT intends to make use of these tools in addition to those supported by the data warehouse team.

The GIS representative interviewed felt that the highest priority improvement need was replacement of the agency's TRIPS system, which is a 1980s-vintage mainframe application for managing the agency's highway inventory and linear referencing system (LRS). A second priority initiative – currently underway – is modernizing the GIS data distribution and publication process. This will result in streamlining data production, reducing effort and eliminating the need for a single individual to process all of the updates.

There are also opportunities to expand use of ArcGIS Online to meet additional specific business needs, build on the initial implementation of the GIS Connector, and further streamline and automate GIS data flows.

4. Information Findability and Dissemination

Current State

WSDOTs individual content repositories (ECM, ProjectWise, SharePoint) have varying search functions. The Data or Term Search (DOTS) catalog allows users to find data objects by business term. At the time of the interviews, WSDOT's internet web site used the DigitalGov search engine (formerly USA Search). WSDOT's intranet site uses the Google Search Appliance (GSA). The internet site has been migrated to Drupal which has a basic search function; Apache SOLR augments the search engine. A similar migration is planned for the intranet site. There are currently no enterprise-wide capabilities to search across different repositories.

Improvement Needs

There is interest in improving internet and intranet search performance in general, and in implementing the ability to search across repositories (DOTS, Library catalog, intranet site, etc.) There is also interest in moving to a more unified approach to search and navigation to provide a consistent user experience, recognizing that each application will have different requirements. To achieve these objectives, WSDOT will need to develop a search

architecture and invest in both tools and staff time to implement and manage the different elements of this architecture.

There are also opportunities to standardize and automate information dissemination in several areas: spatial data set delivery; dissemination of performance and traffic data; use of APIs for external data distribution; targeted content distribution lists; and automated delivery of agency publications to staff, agency and state library.

5. METADATA AND SEMANTICS

Current State

Currently, metadata are applied inconsistently to WSDOT information resources and, when it occurs their use varies by business area. Other semantic tools also vary in standards and application.

- WSDOT currently lacks an intentional practice to manage agency vocabulary in support of search and navigation.
- Previous metadata efforts have relied on subject matter experts to key in metadata for each contribution to the repository. Often, the number of metadata fields is excessive making it very labor intensive to do and most efforts have been abandoned after limited use. Inclusion of library and information science professionals with knowledge of industry best practices in information management and expertise in classification would help in the development of sustainable practices.
- Column headings have been captured in the WSDOT Data Catalog for all ITD managed SQL databases and other that have been submitted to ITD. Preferred terms are identified for some subjects and identification of term relationships has been mapped for a limited set of terms. This information helps map and manage the connections between data resources.
- Glossaries are developed by business areas and vary in approach. For example, it is unclear how broadly terms are vetted, whether legal definitions are considered, and terms are often described rather than defined.
- Some taxonomies for structured data have been developed through discussion between Data Management Services and subject matter experts and others through machine-learning.
    - A Kent State Student study produced a high-level taxonomy for multimodal transportation system assets through a review of legal requirements and discussion with subject matter experts. This taxonomy has not been deployed but has been provided to managers of the current asset management effort.
    - Machine-learning can help expedite the development of taxonomies. System users begin to shape the taxonomy through their system use. It is important for the people training the system to be knowledgeable about the breadth, depth, and history of work areas in order to achieve desired outcomes. Current industry practice is to use machine-learning as an aid to humans responsible for reviewing and updating taxonomies that support search and navigation.
- The department lacks an enterprise thesaurus that would help connect current terms to legacy terms and information resources. A pilot thesaurus was developed for the Practical Solutions AID project but the governance model needs to be established to identify domains and vet term relationships.

A separate effort led by the WSDOT Vocabulary Team has developed recommendations to improve management of metadata and semantics to better support search and navigation of digital resources. These recommendations are discussed in a separate report and a summary of the information is presented here. Dr. Denise Bedford advised the Vocabulary Team in initial stages and the work was developed in coordination with the Practical Solutions AID project findings and recommendations.

The Vocabulary Team recommendations are based on industry standards for development of metadata, glossaries, taxonomies, and thesauruses. The practices are coordinated to promote enterprise term management and nimble to allow for variations based on business need. Recommendations include:

Improvement Needs

The most pressing need is to achieve a commonly accepted strategy for moving forward, including:

- Reaching a common vision and business commitment to implement an enterprise approach to vocabulary management. Endorse the Vocabulary Team and establish governance practices for improved vocabulary management. A governance practice is in development.
- Publishing and deploying the WSDOT Metadata Framework. The Vocabulary Team developed a metadata framework that identifies seven "core basic" metadata elements (title, description, keyword, contact, content type, create date, modified date) for all WSDOT information objects. The schema recommends additional metadata for business areas (such as geospatial) that help improve the relevance of search and navigation for those unique business areas. Allowable values for several of these metadata elements would be drawn from controlled reference sources (e.g. for business functions, subjects, topics, content types, formats); others would be associated with master data sources (e.g. WSDOT organizational units.). The Vocabulary Team also recommends developing tools to automate capture of core metadata in order to facilitate capture of these essential elements.
- Establishing an enterprise glossary. The governance process will provide for updates to the glossary, the incorporation of new content from Subject Matter Experts, and the resolution of conflicting language use. An enterprise glossary has been created by collating all published WSDOT glossaries found in vetted sources and a draft governance process for further development has been written.
- Establishing a taxonomy development practice, enterprise taxonomy registry and governance process. Taxonomy development and use will be supported with a thesaurus that documents term relationships. Understand topics that need enterprise-wide reporting or analysis and use taxonomies to help guide information connections in support of those activities. One taxonomy, a Business Function Classification, has been drafted and is being prepared for review.
- Establishing an agency thesaurus that documents relationships of key terms. Use the thesaurus to support terms used in the agency glossary and agency taxonomies. A draft thesaurus is in development.

6. BUSINESS USER CONTENT CREATION AND UPDATING

Current State

The Computer Aided Engineering (CAE) office has established standard folder structures for project information in CAD software and ProjectWise. Individual business units have established protocols for file naming, folder structures, and version management. For example, the Northwest Region has developed a standard set of folder structures for active construction project information and for design files.

Improvement Needs

Improvements are needed in management of content to meet records retention requirements, facilitate response to public records requests, and facilitate discovery of information across business units. Increased use of content management systems (rather than shared drives) can improve findability, support records retention requirements, and provide version control. Additional training on information management practices can be helpful here as well (e.g. when to discard files; strategies for avoiding duplication). Any improvements in this area need to recognize the importance of providing convenient to use tools that can fit within daily work processes.

INTERVIEW SUMMARY

Based on the interviews, it appears that WSDOT is further along with respect to management of structured data than management of unstructured data/content (emails, documents, etc.) While the agency is challenged with limited resources for IT system modernization, there is a solid infrastructure in place for data management and integration. WSDOT is building on its data warehouse, GIS resources and tools, data library, and data catalog (DOTS) to make further improvements. Key initiatives of interest from the perspective of Practical Solutions are the GIS Connector supporting sharing of information across the life cycle, and further development of the corridor sketch application which brings disparate information together for needs assessment and assessment of alternative strategies. Discussions are underway about capturing additional data supporting asset management, potential future use of LiDAR for data capture, and reporting of integrated asset data.

For unstructured information, key areas of need include implementing a findability strategy, improving the functionality of the intranet site, supporting records management requirements and providing greater clarity to end users on which systems (ECM, ProjectWise, SharePoint, shared drives) should be used for types of content.

Improvement needs for each of the six information management functions are summarized in Table 1.

Table 1. Information Management Interviews Synthesis: Improvement Needs

IM Function	Needs
1. Information/Records Management Policy, Standards, Guidelines, Governance	Unified Vision Resourcing Guidance and Training Operationalize Governance Track Outcomes
2. Information/Records Creation, Access and Use Management	Guidance and Training Management of unstructured information - audits of shared drives, email management, increased use of ECM Identity Management Strategy supporting open data and internal WSDOT business access needs (balanced against security needs)

IM Function	Needs
3. Data Integration & Reporting Services	Data Warehouse Resilience/Redundancy and Staffing BI/Analytics offerings Spatial data/data warehouse integration Streamlined spatial data distribution Further leverage available tools (ArcGIS Online, GIS Connector)
4. Information Findability and Dissemination	Strategy and architecture Streamline and automate information distribution – internal and external; targeted distribution based on role or interests
5. Metadata and Semantics	Common vision and commitment to implement Strategy and architecture (governance practice) for vocabulary management Metadata framework publication and deployment strategy Consolidated glossary adoption and publication Establish practice for development and management of taxonomies Develop an enterprise thesaurus. Develop practices to integrate vocabulary tools into WSDOT Information architecture to support search and navigation.
6. Business User Content Creating and Updating	Increased adoption of ECM Guidance and training – version management, naming conventions, folder structures, file sharing practices

CONCLUSION

WSDOT has developed robust information resources to meet the needs of specific business areas. The Practical Solutions approach is increasing the need for engagement across business areas and with external communities. The current structure of independent business data and information resources was not developed to support the data integration and collaboration needed today. Activities underway to strengthen multidisciplinary, multimodal, multi-organizational, and inclusive outreach practices are highlighting need for better findability and management of shared information resources. This report provides a high level review of the needs and recommendations to address them.

Information gathered from participants in the Practical Solutions AID Project identified sent a clear message that data and information resources are out of alignment with today's business needs. The Information Technology Division is often identified as a barrier to deployment to new technologies and information resources. As a result, business areas develop data resources through consultants or research projects to address their specific business need and these systems need to be woven into the WSDOT information architecture after development. Findability of information remains a key concern for WSDOT's Internet and Intranet and the current organization requires significant labor to respond to public disclosure requests. We can't tackle these issues using current practices.

Like Washington's multimodal transportation system, data and information management is multifaceted and requires multidisciplinary, multi-organizational (internal and external), and inclusive outreach to develop useful, affordable, and sustainable resources. Fundamentally, the recommendations provided in this report recommend use of sound practice for information management and a lifecycle approach for the management and improvement of agency information resources (Figure X). Working together, we can address data and information management requirements and more rapidly meet address priority performance gaps in our data and information resources.

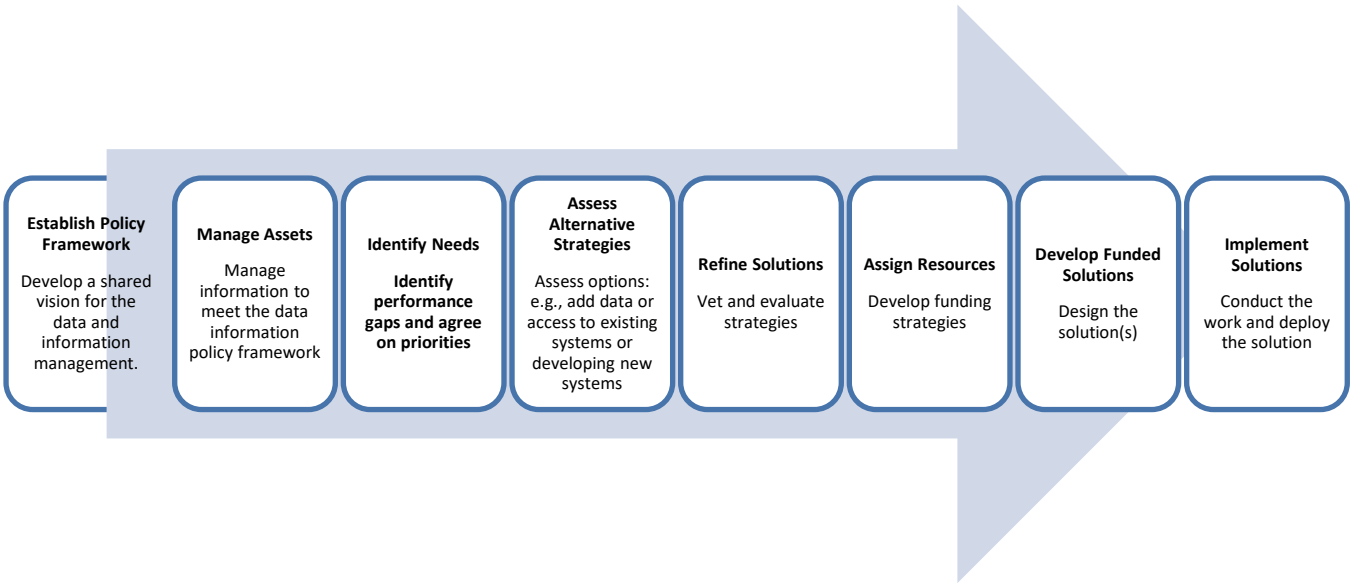


Figure 4. Proposed lifecycle for information improvements.

APPENDIX A. WSDOT INFORMATION ARCHITECTURE RESOURCES

Table A-1 summarizes available resources that WSDOT can build upon to build its Information Architecture. Some of these resources were developed as part of the AID project; others have been developed through staff efforts. General resources for getting started are listed first, followed by resources that are specific to typical components of an Information Architecture. In addition to identifying existing resources, the table also suggests potential next steps or options for building on what has already been done.

Table A-1. Information Architecture Resources and Next Steps

Component	Available Resources	Next Steps/Options
General	• Information Architecture Overview document • Sample templates	• Establish ownership and roles for guiding and tracking the information architecture effort • Establish a charter and implementation strategy • Establish templates and standards for developing and managing architectural artifacts • Develop a training and communication plan that ensures involvement of the right people in each activity and effective dissemination of products
Information Capture & Storage	• ADUS – application inventory • Resource Models – mapping to information assets	• Draft guiding principles for further development and utilization of ECM, Web CMS, SharePoint sites • Document/map standard life cycles for different content types • Develop intranet site architecture • Consider VDOT's corporate document center model • Complete initiative to improve Development Division manual content updates, production and publication •
Search, Navigation, and Access	• Vocabulary Management overview document • Information on data and information resources needed across the lifecycle and applications that support use.	• Develop and adopt vision statement for enterprise search capability (based on business objectives and use cases) • Clarify what type of information to put where and responsibilities for doing so • Establish and deploy enterprise vocabulary management practices. • Mock up or pilot a limited capability to communicate the vision

Component	Available Resources	Next Steps/Options
Semantics	• Draft Metadata Best Practices and Guiding Principles • Draft Glossary/Thesaurus • Draft Business Function Classification Scheme (BFCS) • Draft Content Type Classification Scheme (CTCS) • Draft BFCS Best Practices and Guiding Principles	• Develop scope and architectural options for metadata implementation • Adopt core metadata elements (refine as needed) • Validate and further develop BFCS • Validate and further develop CTCS • Validate and further develop glossary/thesaurus • Develop, document and establish governance processes • Design and implement approach to automating metadata extraction from content (auto-classification and concept extraction) - dependent on architectural decisions
Social Networking/ Collaboration	• Policy Statement	• Form work group to define needs, constraints and options
Data Integration, Reporting & Analytics	• Data mart documentation • Data models • ETL • Geodata distribution catalog	• Review current data and information stewardship model against other options (e.g. MnDOT domain stewards; FDOT functional stewards) • Identify opportunities to improve decision support through deployment of BI/analytics capabilities • Identify opportunities to improve consistency and efficiency of project information reporting considering data mart, Beige Pages, Project Web Sites • Develop future vision statement considering new data and information sources, CAD to GIS integration; GIS/Data Warehouse integration and emerging needs for asset management, performance management • Develop vision for corridor sketch application that produces reusable components/services to meet similar needs in the future
Master Data Management	• ITD Data library	• Assess gaps in existing data library – prioritize improvements based on inefficiency and risk • Investigate issues with project and HR data (File 155) currency/synchronization

Component	Available Resources	Next Steps/Options
Information Access	• WSDOT IT Manual • Open Data Plan	• Review existing information access management practices to identify business needs for less restricted access (internal to WSDOT and external) as well as risk areas to be addressed • Clarify expectations for transparency with respect to information and application access across Divisions/business units

APPENDIX B. REVIEW OF PRIOR WSDOT INFORMATION MANAGEMENT WORK

Over the past several years, WSDOT has identified a number of general needs and recommendations for improved information management. The following summary list of observations, issues, needs and recommendations was compiled from several documents provided by WSDOT staff.

A. Summary Overview of Enterprise Information Management Initiatives at WSDOT from 1998 to 2006, Prepared by Gordon Kennedy, WSDOT Office of Information Technology, October 4, 2011

- Frustrations finding and obtaining reliable information for business operations is a well-known problem at WSDOT, long attested to by anecdotal evidence offered by many senior managers. Recent meetings of those managers have reinforced the need for better agency-wide information management in order to reduce the time staff must invest in locating, acquiring and interpreting data that are needed to conduct business operations. There have been previous attempts to study and fix aspects of this problem.
- Certain kinds of data are used across multiple business functions and should be reused. WSDOT's business tools (software) and databases are not well integrated for sharing of such common data. Data is often shared through manual re-entry or special database-to-database transmissions.
- The lack of integrated systems hinders the re-use of data, and this has spawned data duplication. Some data is collected multiple times by different offices' field crews. Multiple copies of data exist, often with differing content. This leads to conflicting information from different systems.
- WSDOT's information systems are "siloed," which means there is a level of autonomy and independence of business units that hinders the development of common practices. The agency's business units have the operational, staffing and financial autonomy to develop data resources, methods and tools focused on their own specific functions, and IT has generally managed these initiatives as independent projects.

B. Toward Enterprise Information Management DRAFT 8/15/2011

- …information is delivered to us in many formats including paper, web sites, databases, and electronic formats. Limited tools exist to coordinate these resources making it difficult to find information and to manage these resources efficiently and cost effectively. How we manage information, however, can and should change. Many studies show that there is a significant loss of productivity caused by poor access to information. We have an opportunity to more cost effectively manage this information asset with strategy and intent to better serve a smaller, distributed workforce.
- It is recommended that WSDOT Establish an enterprise information management structure including:
    - An EXECUTIVE COMMITTEE to provide mission and scope oversight for enterprise information management in support of WSDOT's strategic plan and core business needs. Members should include senior managers with responsibility for data and information repositories and broad strategic goals and assets of the department.
    - A TECHNICAL TEAM to raise and/or address technical feasibility of proposed actions. Members should include managers responsible for the technical disciplines needed for effective management of information.

- SUBJECT MATTER COMMUNITIES OF PRACTICE to raise/guide/address subject matter information needs and maintain awareness and effective use of resources.

C. Enterprise Information Management Roles and Expectations – Discussion Document, Leni Oman, 2014

- Employees and stakeholders want to easily find and retrieve the data and information to meet business needs and easily manage capture and organization of their data and information products. The department seeks to manage information necessary for business functions, reduce redundancy in collection and storage of information, improve findability and use, and manage retention of data and information.
- Data and information management practices have continued to change rapidly in recent decades. Individual employees now have the capability to collect, capture, use and publish information. Data analytics have become increasingly complex and interdisciplinary with access to more information. These activities have occurred without an enterprise-wide information architecture. This has resulted in a fragmented system in which there is perceived duplication, incompatible systems, and inefficient data collection practices.
- An enterprise information architecture should be developed to clarify foundational information needs, and the sources of and connections amongst information resources and provide a blueprint for information resources. This architecture can be used by information technologists to design hardware and software solutions that meet business needs. An information architecture also provides a stronger foundation for data analytics, open data and information, public disclosure requests, and other interdisciplinary work.
- The enterprise information architecture would address several specific areas including: data and information connections between business domains, primary sources of information and efficient collection strategies, core metadata to support findability of relevant information, information organizing schema, and roles and responsibilities for content management.

D. Management of Data and Information Content at WSDOT, Report to the Enterprise Information Governance Group, April 9, 2015

- Current State:
  - WSDOT has several content repositories (Oracle IPM (formerly Optika/Stellent), ILINX (Replacement for Oracle), OpenText Content Server (formerly LiveLink), Bentley ProjectWise, SharePoint Team Sites
  - Some of the repositories offer enterprise access, while others are limited, creating content silo's.
  - These silos contribute to the duplication of data. It can be difficult to identify the "authoritative source" or "document of record."
  - Standard Taxonomy and/or Metadata is not leveraged for increased findability of content.
- Recommendation: Develop a vision and plan for managing WSDOT's data and information:
  - Provide guidance for intended uses of existing resources. Update as repositories change.
  - Not one size fits all. Must be scalable and support search across repositories.
  - Must be kept as simple as possible to facilitate adoption.
  - Needs clear policy direction on expectations from executive management to facilitate adoption, perhaps through updated E 1037.
  - Must include buy-in from executive management and active management support
  - Must integrate agency requirements for records management and publication capture

E. A Vision for Asset Data, August 21, 2013

- Issues to Address:
  - Asset data is distributed throughout the department in independent databases. Many of these databases do not readily exchange information (due to a lack of common data naming and definition conventions).
  - Asset data collection and condition assessment data is not synchronized and there may be duplicative effort and equipment.
  - Asset data is not readily findable or retrievable. They are in varied platforms and do not have consistency in attributes collected or terminology used. Also, no directory exists that specifies which data base has been identified as the enterprise source data.
  - There is inconsistency in content collected for different types of asset. Some collected data does not seem to have a business purpose while other assets are not resourced to collect basic asset data.
- Vision:
  - A data resource that contains the core content needed to meets the department's business needs and is findable by employees and WSDOT consultants throughout the organization.
  - Data collection is conducted in a streamlined manner that supports quality, reduces redundancy, and is most cost effective for the department.
  - The authoritative source is clear. Versions are controlled and accessible as necessary to meet business needs.
  - Decision makers and subject matter experts have access to a common pool of data to meet their business needs.
- Challenge:
  - How to synchronize and simplify asset data collection & maintenance, including ability to account for new asset installation as well as rehabilitation and repairs. In addition, how to track assets that would be replaced or rehabilitated under different budget investment options for annual and future performance reporting. Synchronizing data has the potential to reduce the number of asset management systems and reduce the amount of funding needed to manage and share the data that is collected.

F. WSDOT Information Governance (Draft document, undated)

- The Washington State Department of Transportation (WSDOT) manages a vast body of information across 12 operating systems, 7 different data platforms, over 450 software applications, 1,119 databases, 37 programming languages, and over 1,000 physical and virtual servers in 10 data centers. Over 7,000 personal workstations also contain additional data and information. There is a need to develop an enterprise decision-making process related to data and information management across all department programs and to communicate data and information development for current and future needs. Benefits include decreased costs, decreased risks, improved efficiency.
- The following information principles were adopted by the Enterprise Information Governance Group (EIGG):
  - Data and information are collected, managed and used by staff across department programs. WSDOT seeks to collect and manage data and information that is appropriate, functional, and cost-effective.

- Data and information quality are critical to effective business decision making at WSDOT and shall be maintained in a manner appropriate to meet business needs.
- Data and information are strategic, long-term assets – owned by WSDOT, not by individual business units. They are findable, retrievable, and shared.
- Data and Information shall be collected once, stored once and used multiple times.
- Data and information that is not used shall not be collected or stored.
- Data and information that is used by multiple applications or shared across business units shall be defined and managed from an enterprise perspective and fit for a variety of applications.
- Data and information investments will consider business priorities, program impacts, and trade-offs.
- Data and information shall be managed to ensure availability, security and integrity—it shall be both safe from harm and accessible by those who need it.
- Data and information governance, costs, and stewardship processes will be transparent. A record of changes to decision-making processes and controls will be maintained.

- Current information challenges are:
  - Siloed Approach to Creating, Managing, and Sharing Documents
    - Business units have the operational, staffing, and financial autonomy to develop information resources according to their functions and needs. Business units view their information as unique and requiring special knowledge to collect and manage it. Due to this perceived nature of the information, incorporating the different needs of all business units and stakeholders in any initiative is seen as challenging.
  - Duplication of Information within and across Repositories
    - WSDOT's software and databases are not well-integrated for sharing of these common resources
    - There are no enterprise controls in place to prevent individual employees from creating a database without regard for redundancy, standards, or sustainability.
  - Information Findability and Access Challenges
    - Need for improved information classification
    - Need for user training on searching information as well as technical training to make information findable
    - Challenges in identifying information that is valuable and needed to drive decisions
    - Difficulty finding staff who are knowledgeable and responsible for the information
  - Changing Regulatory and Industry Standards
    - For example: Washington State Information Services Board standards, laws pertaining to confidentiality, public disclosure exemptions, Purchase Card Industry standards, and contractual agreements.

APPENDIX C. INFORMATION MANAGEMENT INTERVIEW RESULTS BY TOPIC

This appendix summarizes interview responses for each information management function. Information management functions covered are organized as follows:

1. Information and Records Management Policy, Standards, Guidelines and Governance
2. Information/Records Creation, Access and Use Management (operational functions)
   A. Records Management Execution
   B. Access and Security Management
   C. Workflow Management
3. Data Integration and Reporting Services
   A. Data Warehouse
   B. Geospatial Data Management
4. Information Findability and Dissemination
   A. Search and Navigation
   B. Information Distribution/Dissemination
5. Metadata and Semantics
   A. Metadata Creation and Management
   B. Master Data Management
6. Business User Content Management
   A. File Management Practices
   B. Use of Enterprise Content Management Systems (ECMS)

1. INFORMATION AND RECORDS MANAGEMENT POLICY, STANDARDS, GUIDELINES AND GOVERNANCE

WHAT'S INCLUDED?

- Information Architecture Principles and Standards
- Information Technology Governance
  - New System Acquisition
  - Change Control
- Data Governance
  - New Data Collection Policies and Processes (coordination/approval)
  - Data Stewardship and Custodianship Roles
  - Authoritative Source Identification
- Policies, Procedures, Rules, Resources:
  - Classification Scheme/Filing System
  - Records/information classification scheme/filing system, schedules
  - Department-wide records/information disposition schedules
  - Metadata archiving
  - Content Storage Locations
  - Email management
  - File Sharing
  - File Naming Conventions
  - Folder Hierarchies
- Employee Training and Support
  - Training Materials

- Onboarding Process
- Support Services (e.g. help line)

Current State

- Principles, Standards, Policies
  - Best practices in IT manual, Executive Orders
  - EIGG Charter, Data and Info Principles – stewardship definitions
  - Follow the Data Management Body of Knowledge DMBoK
  - Records Management Policy, Retention Schedules
  - Drupal – external web site standards
  - Information Technology Infrastructure Library (ITIL) SLAs
- Training:
  - Have security training – annual requirement
  - Records management training underway
- Investment Decision Making
  - ITD Initiative Process
- Classification Systems, Taxonomies
  - Content Management Taxonomies (Oracle/ILINKS, PMRS/LiveLink)
  - ProjectWise file organization
  - SharePoint File Organization
  - Standard Regional and business unit folder hierarchies
- ITIL (2007-2008) – used SLAs, but many aspects have dropped out.

Improvement Needs

- Separate out best practices and procedures, make available through easy to access interface – e.g. FAQ, contact person
- Develop more unified set of policies (after completing assessment of what exists)
- Reconcile policies – agency, statewide with cloud services and other hosted solutions
- Address unmanaged, out of date info, people hanging on to their information indefinitely
- Implement a corporate documents center – for authoritative agency content
- Mandatory training for new employees – link Records and Information Management
- Provide online resources, e.g. FAQs
- Update position descriptions - include requirements for computer skills
- Update 20 questions to ask when someone wants to initiate a new system (to align with principles)
- Create needs identification and alternative strategies function for the EIGG
- Consider domain steward idea (from MNDOT) – but include stewards for unstructured information, not just tabular data
- Further development of role for enterprise information management
- Develop written guidance for publication of department work
- Continue training for both IT staff and other agency staff to build understanding and awareness of IM and RM expectations and practices.
- Provide storage locations, archiving, newer technologies to support content management, record management
- Given that WSDOT is managing more and more electronically – need to better understand authoritative sources, official copies
- IT governance: moving target trying to align with OCIO changing needs.

- Address critical applications (ref: study) – currently in survival mode (keeping lights on)
- Increase use of ECM
- Work with business units to improve records management processes
- Need engaged people representing each discipline that can make decisions about standard systems, standard approaches to data – across engineering, fiscal, administrative
- Need to identify roles for process improvement and evaluation and get endorsement (from field up) – for example, as-built owner, ex: contact for mobile devices.
- More clarity on data ownership
- Greater awareness of the value of general solutions (rather than siloed solutions)
- Need for greater appreciation or way to agree on business need to maintain long term access (internal and external) – not always accounted for in the life cycle management process – may want to have copy in library as well as archives. Recognize different life cycles – archives vs. library
- Too many places to store information; need for more strict policies about where to store; make sure that technologies are relevant.
- Guidance and oversight – look at the context; link rather than duplicate.
- Inventory of where everything lives – decide how to winnow down
- Look at how to improve SharePoint - not set up to allow statewide access
- Tradeoffs: security vs. convenience; access by local partners
- Guidelines and training on naming conventions (but can't wait for process to agree on a standard)
- Make progress on IA, taxonomy, data definitions

Priority Actions and Barriers to Overcome

- Improve EO/Policy area – to facilitate searching (not just by number)
- Separate policies from procedures, providing access
- Update and consolidate existing policies
- Improve awareness of need for enterprise view - clearly describe the problem and how to address it
- Strengthen leadership support – intent must be clear to motivate action, consequences need to result from not following policies
- Develop a shared vision with executive team, critical nature of our systems and where we are going
- Increase resourcing – only putting "catch-up" stuff in budgets, resources being consumed by emergent issues rather than strategic initiatives
- Strengthen EIGG, ensure they are empowered to implement/operationalize governance. Clarify outcomes.
- Establish ownership and authority
- Increase authority of information governance body - should be prioritizing
- Getting buy-in. Have a lot in place but still feel that there is a lot more to do – evangelizing, management appreciation of importance of info assets, recognize liabilities/risk, inefficiencies.
- More transparency about whether we are hitting our mark – performance reporting on this.
- Training – increasing awareness of what public records are and what their obligations are
- Identifying collaborative opportunities – understand different systems and how they can talk to each other.
- Improved partnership with records

2. Information/Records Creation, Access and Use Management (Operational Functions)

A. Records Management Execution

What's Included

- Digital archives repository
- Audit trails
- Retain/archive records
- Track disposal status of records
- Dispose of records
- Transfer custody of records
- Maintain folders and boxes according to filing plan

Current State

- Records management function doing training, working with business units
- Data management works with business groups on retention schedules, write routines to dispose of data
- Open data representative at state level; plan for open data by October
- Pain Points: time spent searching for information in addition to time spent for FOIA response. Also have had documents inadvertently disposed of. Ex: contractor had email from employee; but those weren't kept when the employee left. Many other examples where people couldn't locate documents.
- Email management is an issue – but project documents end up being stored separately; challenging since you do want to keep the metadata from the project.

Improvement Needs

- Would like ECM to be agency-wide, not being implemented with RM capabilities. (DOD compliance?) AWV product is being used in a manner more consistent with RM practices.
- Agencies are required to follow the general state RRS. Just overhauled – need to crosswalk prior schedule
- Auto-archiving of emails into a vault (for Outlook) – avail from SW IT agency (IT looking at product from Microsoft) – issue: need to retain physical custody of records (can't use cloud)
- Shared vision for labeling/classifying information
- Need enterprise-level understanding of business activities (rather than organizational unit based)
- Consider perspective: "everything is open except for xyz" – locked-down model inhibits business access
- More of service orientation – helping to preserve, create clarity
- Clarify: if it is a WSDOT publication it should be in the WSDOT library – something can be a publication and a record.
- Need for guidance on publication, use of WSDOT materials

Priority Actions and Barriers to be Overcome

- Collaborative alignment of RM and IM within the agency
- Complete records management work with highest priority business units– starting with OEO, AWV Project, Tolling

B. Access & Security Management

What's Included

- **User Access Management**
  - Establish access categories and rules

- Define user access profiles
- Define roles and privileges
- Assign privileges to individuals
- Maintain and manage user group profiles

- **Information Use Management (Security/Integrity)**
  - Define use transactions (create, read, update, delete)
  - Define and manage security classifications
  - Define user security profiles – individual or group access
  - Extract/redact restricted content
  - Perform security audits

CURRENT STATE

- Follow OCIO Data Security Classifications
- For structured data/applications – active directory setup, assign roles
- Business leads determine assignment of privileges – access assigned based on need
- Use identity management system to expand some of the access to people outside of Department
- Have policies and processes in place for structured data
- Leveraging federated services
- Statewide policy to focus on open data
- APIs developed (on request) for data sharing – e.g. INRIX
- Store all server info to tape

IMPROVEMENT NEEDS

- Unstructured information is biggest gap
- Greater awareness of how to get access to systems, knowing what systems exist – missed opportunities
- Ensure permissions are discontinued when employees are terminated
- Improve procedures and audit functions related to posting information on file shares.
- Payment Card Industry
- Looking at SAW (Secure Access Washington) – way to integrate with central state system.
- Records training to cover PII, security classifications
- Would like new EIGG to consider some policy changes regarding ownership of rights to access information; currently within purview of business unit to establish access rights
- Review whether core metadata would need to potentially reference security exemptions

PRIORITY ACTIONS AND BARRIERS TO BE OVERCOME

- Solidifying the user base – ensuring timely, accurate information on employees + external consultants.
- Addressing the file share and SharePoint environment – identify and rectify violations
- Improve identity management, ability to federate, manage access to other entities (FHWA, other agencies, etc.)

C. WORKFLOW MANAGEMENT

WHAT'S INCLUDED

- **Workflow Management**
  - Define and maintain workflow tasks, routes, and participants
  - Define integration of tasks and data, including business rules
  - Define and maintain association of documents with defined steps of the workflow
  - Define and maintain workflow security – access rights

- Provide workflow audit logs

CURRENT STATE

- TEAM foundation services
- ECM workflow services
- Out of state travel approval (file 155)
- Accounting system includes workflows

IMPROVEMENT NEEDS

- Challenge – have 3-4 enterprise solutions, using each a bit differently (content management solutions)
- Leveraging ILINX for workflow development
- Digital signatures – big opportunity
- Might be addressed through LEAN projects, ECM
- Reduce fragmentation of workflow related to data, records and information management – can't see full picture. Dashboard view. See what is in the pipeline and what the status is. Hard to synchronize activities.
- Consider implementing a business rules engine

PRIORITY ACTIONS AND BARRIERS TO BE OVERCOME

- Identity Management and Digital Signatures
- Improve awareness of opportunities for advancement

3. DATA INTEGRATION AND REPORTING SERVICES

A. DATA WAREHOUSE

What's Included

- Data Warehouse and Reporting
- Data mart updates/additions
- Reporting tool updates/improvements
- BI/analytics service development

Current State

- Data Warehouse (good awareness)
- COGNOS reporting
- Asset Management System needs analysis

Improvement Needs

- •Single system – integrated reporting – support tradeoffs across assets, executive views
- •Desire to avoid duplication, improve data sharing – need to overcome feelings of ownership, fear of misuse; some data needs to be protected
- •Way to look at multiple performance measures
- •Want to see: asset category, location, age, characteristics, breakdown into components
- •Would like to have a dashboard to show performance measures
- •Dashboards, visualization analytics
- •Big data platforms
- •Integration of structured and unstructured (e.g. for assets, projects)
- •Additional spatial data integration – treat GIS as a flavor of BI, more seamless tie
- •Asset data mart – with business process to get reliable data

Priority Actions and Barriers to be Overcome

- Improved infrastructure supporting data warehouse – more resilient environment, increase staffing levels give size of program (at 25% of what we should have)
- Better disaster recovery
- Addressing the silo culture – the One DOT initiative
- Dashboards (spatially-enabled)
- Spatial data integration – seamless way to analyze data

B. GEOSPATIAL DATA MANAGEMENT

WHAT'S INCLUDED

- Spatial data integration and access

CURRENT STATE

- Geodata Distribution Catalog
- GeoPortal
- ArcGIS Online
- COGNOS Plugin
- GIS Workbench (desktop)
- ProjectWise geo-connector
- Have: pavement, bridge, TRIPS data

IMPROVEMENT NEEDS

- Expanded use of ArcGIS online
- DW integration
- Some need for improved spatial accuracy for some assets – SIMMS, signs – not properly identified in the LRS, missing collection dates (working on data cleanup), ADA being located
- Nail down data needs and integration requirements
- Have too many mapping experiences – Google, static, etc. need to standardize – e.g. mapping solution on website for traveler info
- More use of ArcGIS Online, story maps
- Consider COTS products – DW/GIS Connectors
- Allow people ability to access spatial data in different ways
- Improve and streamline integration methods - currently integrate via exports, ETL into data sets in the Workbench; or through map service – but not live, and can't mix and match
- Modernize distribution of data

PRIORITY ACTIONS AND BARRIERS TO BE OVERCOME

- Address LRS – biggest risk – mainframe system from the 1980's, written in COBOL, difficult to maintain. Need to migrate. On critical system list. Could do for 3-400K. Using R&H, will contract out LRS data model TRIPS.
- GIS connector in PW to provide better access, get features into SQL databases
- Modernizing the distribution and publication process. Requires some restructuring of databases. GIS stewards 30 different data sets; Environmental Division stewards 20. All data get delivered a single individual who reviews them and moves them into production – cumbersome process; bottleneck. Lots of will to improve but limited bandwidth. Could change business processes - to allow a data steward to update

their data, drop into a folder, submit and automatically replicate and put into production, updated map service. Would be less work.

4. INFORMATION FINDABILITY AND DISSEMINATION

A. SEARCH AND NAVIGATION

What's Included

- **Enterprise Search and Navigation (findability/access)**
  - Search architecture, index structures, indexing performance optimization
  - Design search interface, presentation options, sort options
  - Query processing and matching rules
  - Define navigation and browse paths
  - Define search performance standards and metrics
  - Capture search and browse transaction logs

Current State

- New Web CMS Implementation (Drupal)
- Library Catalog – Millenium (Innovative)
- SharePoint (FAST)
- Search logs and browsing trails available for Web ECM

Improvement Needs

- Need to get an understanding of who is trying to find data and why – see the multiple users and uses
- Search application that leverages enterprise taxonomy(ies)
- Improved intranet search
- Federated search capability - Integration across repositories (DOTS, Library, intranet, etc.)
- Auto-categorization (assignment of metadata)
- Analysis of existing content – what exists, when last used.
- Consistency in file structures, use of ECM
- Keyword search yields large volume of records to manually review and redact – need to improve precision (RM)
- Need to support people that search spatially and people that don't.
- PW search improvements – have attributes defined but metadata interfaces not yet built out, need to communicate/sell to users, location search, spatial view
- Federated search based on PIN, WIN, location, program (for financial, programming)
- Possibly share MARC records from WSF with main library (as appropriate)
- Alternative to Innovative (state library system) – funding has been an issue.
- Follow up on search log findings
- Currently using USA Search.GOV (BING) – caches everything
- Would like to move to Solr
- Clean up of content
- Internal site – using GSA (limited to intranet – not applications or data – limited crawling scope)
- Need to prioritize investment in search

Priority Actions and Barriers to be Overcome

- Architecture that would support enterprise findability (with flexibility for each business unit to use their own organizing structure)
- Deciding what to include in enterprise search

- Internal education and context setting. You are part of the problem or solution. (e.g. use of external website for primary information storage)

B. Information Distribution/Dissemination

What's Included

- Personal interest profiles
- Content subscriptions
- Content delivery/posting strategy

Current State

- Federal reporting (HPMS)
- Email distribution lists (but unmanaged)
- Traffic data distribution (but for individual applications - APIs)
- Publish project information to the web
- GIS community portal
- GOV Delivery – Listserves
- Corridor Sketch (in progress)

Improvement Needs

- Automate data publication, making sure that data is getting pushed out. Pretty good now, but if you go to AOL, will only find things published as map services; in web page – only download; Workbench provides flexibility but is also the most difficult environment
- AOL, ArcGIS Catalog, ArcGIS Online - Just need to put business process in place.
- Open data – delivery of data/content to the public
- Additional APIs
- Automated delivery of agency publications to agency and state library
- More targeted information distribution
- Developing asset management web page (external) – information about the asset – with links to all of the existing information. Will cover the 24 asset categories.
- Identify personal portal/list of favorites given large number of portals/info access points – possibly a customizable dashboard (by discipline)
- Some opportunity to improve distribution of agency publications – more consistent process for people to sign up
- WSF working on systemwide dashboard – one stop state of the system resource for managers – terminal and vessel maintenance status, crewing, seasonal changes (single dashboard)

Priority Actions and Barriers to be Overcome

- Distribution of Performance management & Traffic performance information
- Automated process for publication

5. Metadata and Semantics

A. Metadata Creation and Management

What's Included

- **Develop/Maintain Metadata Schemes**
  - Record Structures and Data Element Specifications
  - Mappings from source to institutional systems

    - Metadata architecture for language variants
    - Metadata export protocols (SKOS)
- **Create and Maintain Metadata Repositories**
    - Design/Procure/build common metadata repository
    - Monitor and maintain metadata quality
    - Map and harmonize metadata values
    - Define harvesting/import/loading and export capabilities
    - Update metadata from source systems
- **Develop/Maintain Controlled Reference Sources**
    - Subject and business terminology (equivalent terms, hierarchical terms, associative terms, definitions/scope notes, source and origin status, etc.)
    - Authority Files for named entities (other than master data)
    - Classification Schemes (content types, business functions, subject classes, format types, etc.)
    - Semantic profiles for automated indexing, classification and summarization
    - Governance process
    - Authoritative systems for managing vocabularies
    - Vocabulary publishing, distribution, integration services
- **Categorize and Summarize Information**
    - Create abstract/summary
    - Assign indexing or subject values from CV
    - Assign organizational filing values
    - Assign security values from security classification scheme
    - Assign business activity value from business taxonomy
    - Encode and register metadata in repository

Current State

- DOTS – preferred terms, controlled lists for various fields, harvesting processes
- Draft core and extended metadata schemes and associated controlled lists
- ECM Metadata schemes
- Chart of Accounts
- Geographic regions – many sources and definitions
- Drafts business function, content type classification schemes
- State Library – controlled lists (MARC format)
- (Highways, Ferries, Multi-modal, Facilities (Enabling), Data) – 5 categories.
- Library cataloging
- Data stewards works with data management to assign classifications as part of project intake process (including PII, etc.)
- Records Retention Schedules
- Asset Management classification current categories: Pavement, Bridge, Unstable Slopes, ADA, Culverts, SW, Fish Passages, Signals/ITS/ Illumination; some ambiguity – e.g. barriers (median barrier, concrete)

Improvement Needs

- Communicate distinction between metadata and taxonomy
- Shared vision and plan for how we want this to work
- Make the case for resourcing and implementation
- Getting to a mode where when people are developing vocabularies that they think to share/coordinate – shared rather than siloed resources

- Need for common understanding of metadata (there is legal definition under case law in WA) – also reference to "indexing" of records
- Governance – change management, designation of what is authoritative for different purposes
- Common language/taxonomy, structure for integrating and managing this (by people who understand purpose and how to do it well.)
- More consistent metadata
- More internal training on file naming, metadata, storing docs for findability
- Finalize and adopt metadata schemas (FGDC, core, etc.)
- Implement governance to manage metadata schemes
- Integrate with search and navigation
- Integrate into workflow (may be more taxonomy) – e.g. payment system
- Integration with COGNOS - currently manually load data metadata (data dictionary info)
- Implement within content management systems
- Automate categorization – auto population tool
- Integration strategy – beyond DOTS
- Delivery of the metadata (e.g. definitions to data warehouse)
- Integrating metadata into COGNOS and other query tools
- Metadata maintenance and stewardship - used to have at least one GIS person in every region, every business area – now many of these are gone; there are many orphaned data sets not being stewarded, or not by an expert.
- Re-initiate cross discipline group to discuss common metadata needs and requirements (was a highway features inventory initiative led by Gordon K)

Priority Actions and Barriers to be Overcome

- Commitment by business units to provide/create metadata (ensure involvement of SMEs with knowledge of the data)
- Actual implementation
- Vision document to communicate importance to lay people – get more engagement on the part of business units
- Common vision about taxonomy, metadata and strategy to apply – to make headway on improvement of intranet search
- Governance – ownership and change management
- Understanding of value provided, hearing a consensus voice across different IM disciplines
- Categorization strategy – standardization across organization (or among key people)
- Commitment/agreement to resourcing this

B. MASTER DATA MANAGEMENT

What's Included

- Identify Master Data:
    - Project Numbers and Names
    - Jurisdiction Codes and Names
    - Organizational Unit Codes and Names
    - Account Codes and Names
    - HR Job Titles and Classifications
    - Employee IDs and Names
    - Etc.
- Assign Stewardship and Custodianship Roles
- Establish Master Data Source

- Architect Alignment/Integration with Business Systems
- Manage interfaces with business systems

Current State

- WSDOT Data library – common reference data – region names, spatial elements; integrated with IS application development process
- Data Warehouse Conformed Dimension Subcommittee
- PMRS Activity and Code Management Process
- Chart of Accounts
- Roadway Data/ Spatial
- File 155 (Employee Info)
- Identity management database
- Materials master lists

Improvement Needs

- People Data – improve currency (File 155), reduce fragmentation with HR systems
- Project Data - multiple distribution channels, not in sync; need for unified approach and workflow across business units
- Asset Data - Unique identifiers for assets (under discussion)
- Data Library - Add more elements to WSDOT's data library, and more interfaces to master data in the library with applications coming up for a maintenance cycle

Priority Actions and Barriers to be Overcome

- Understand where current master data (not currently in warehouse) is
- Increase resourcing for the data library (currently have only 20% of an FTE)
- Implement interfaces to the data library when there are opportunities

6. Business User Content Management

A. File Management Practices

What's Included

- **Add/Update content on Shared Drives**
  - Use standard folder structures
  - Use standard file naming conventions
  - Manage versions
  - Update document properties/metadata

Current State

- Region-specific protocols

Improvement Needs

- Try to get people to not retain what they don't need to (training about what is transitory; what makes you a record owner) – make people understand what they can legally toss.
- People are doing publishing within their small groups – not to the public.
- Overcoming file cabinet mindsets - encourages duplication of information and inhibits sharing. For example, information is maintained by organizational unit rather than by project (e.g. traffic group working with a region)
- Access privileges prevent wider use of information – e.g. SharePoint sites, shared drives are restricted

Priority Actions and Barriers to be Overcome

- Encourage greater use of document management systems rather than shared drives

B. Use of Enterprise Content Management Systems (ECMS)

What's Included

- **Manage and configure ECMS**
  - Establish metadata requirements
  - Configure metadata inputs
  - Establish version management policies
  - Configure version management features
  - Establish policy for copy/move/deletion per records disposition schedules
- **Add/update content in ECMS**
  - Add/update content
  - Provide required metadata (can be partially automated)
  - Manage versions in accordance with established policies, using configured methods/rules
- **Add data to enterprise databases**
  - Add/update records
  - Provide required metadata
- **Transform Content**
  - Extract or convert (e.g. scan paper document, produce report or chart from database, combine multiple files into a single PDF)
- **Transfer, Preserve, Archive Content (inactive phase)**
  - Copy/move to archive
  - Convert format
  - Delete/Destroy Content (per retention schedule)

Current State

- iLINX
- Oracle IPM (Stellant)
- OpenText Content Server (PMRS/AWV)
- SharePoint
- ProjectWise (PW)
- Drupal

Improvement Needs

- Too many competing systems – rationalize what to use when
- Implement metadata features in PW
- Standardize metadata across like systems, improve flexibility in entry and search (synonyms, spellings)

Priority Actions and Barriers to be Overcome

- Get better understanding of what we are doing and why

APPENDIX D. INFORMATION MANAGEMENT INTERVIEW NOTES

This appendix summarizes responses by information management functional area, covering both portions of the questionnaire – information needs to support Practical Solutions, and information management improvement needs.

AREA: TRANSPORTATION ASSET MANAGEMENT

Representative: Mitzi Frick, Asset Management & Assistant Project Delivery Manager

INFORMATION NEEDS TO SUPPORT PRACTICAL SOLUTIONS

- There is a need to break down silos of data and make it accessible. Currently, it is impossible to get a consolidated report on the condition of all of WSDOT's infrastructure assets.
- WSDOT will likely need to pursue a distributed model (rather than a centralized approach) - with integration across individual asset data repositories – we don't have the structure or resources in place to do this in a centralized fashion. Vision would be to integrate information from HATS, PMS, BeiST, SIMMS, etc. and fill the gaps where current systems don't exist; provide a path for replacing existing systems in the future. This would provide greater visibility into the source systems.
- Current decisions about data acquisition are made by individual asset stewards. Mitzi serves as the asset management coordinator; there is an Executive Oversight Group chaired by Kevin Dayton. There is a need for some degree of further role clarification with respect to decision making about data.
- Asset Management recently completed a self-assessment, which raised awareness of data value and costs.
- An overall TAM vision hasn't yet been developed; we are currently meeting with each asset steward to develop individual asset management plans.
- Asset stewards are currently using as-built plans to update asset information. This is particularly helpful for underground items. They would like to obtain information at the design stage.
- Implementation of the GIS Connector for ProjectWise is underway. More work is needed here on process and standards to support extraction of asset data from plans.
- There is currently some discussion about responsibility for updating the inventory – asset stewards don't always know what an asset is added.
- Historically there has been a "wall" at WSDOT between Maintenance Operations and Engineering/Construction. Communication between these two groups is improving with formation of the HAMTAG (Highway Asset Management Technical Advisory Group), which includes Maintenance Operations and the asset stewards.

INFORMATION MANAGEMENT IMPROVEMENT NEEDS AND PRIORITIES

Data Warehouse and Reporting

- Integrated reporting across assets – asset quantity by category, location, age, characteristics, breakdown into components
- Executive views of asset information
- Dashboard showing multiple performance measures to support tradeoffs

- Currently there are various ways of managing asset data; need to work on putting a new business process in place to get reliable and consistent data that could be reported in an integrated fashion. (Technology is not the hard part here.)

Spatial Data Integration and Access

- There is some need for improved spatial accuracy for some assets –for example, signs are not properly identified in the LRS; ADA assets are currently being located.
- Would like to have an integrated pool of spatial and tabular data to work with – drawing on the data warehouse and GIS capabilities.
- Further use of available visualization tools (e.g. ArcGIS Online, story maps.) Still exploring specific data needs and integration requirements

Enterprise Search and Navigation

- Currently keep asset management files on SharePoint
- Need to get an understanding of who is trying to find the data and why – see the multiple users and uses
- Need to manage some of the megaprojects as being own asset (e.g. AWV)
- Not much discussion about unstructured data related to assets

Information Distribution and Dissemination

- Currently developing an asset management web page (external) – includes links to existing information about 24 asset categories.

Metadata and Semantics

- Asset categories have been established: Pavement, Bridge, Unstable Slopes, ADA, Culverts, SW, Fish Passages, Signals/ITS/ Illumination
- Still exploring/thinking about need for classification of asset information – for example, distinguishing barrier types
- Have also been discussing "tiers" based on criticality (and level of data and formal planning processes)
- Have been discussing unique identifiers for assets
- Would like to think about/discuss metadata further

Other – Activities of Note

- Ferries asset management is fairly mature, use MPET system.
- There was a research project on LiDAR data collection a few years ago. Haven't yet figured out how LiDAR data would be integrated into existing systems and maintained.
- Maintenance Accountability Program (MAP) data are available and helpful for performance management.
- Highway Activity Tracking System (HATS) – working to build ability to track cost by asset and location to provide feedback.
- WSDOT has participated in two FHWA pilots related to climate vulnerability assessment, with implications for transportation asset management.

AREA: GEOMETRIX/COMPUTER-AIDED ENGINEERING SUPPORT

Representative: Clint Hill, CAE/CAD Support Engineer

INFORMATION NEEDS TO SUPPORT PRACTICAL SOLUTIONS

- The most accessible methods for data sharing at WSDOT are the GIS workbench and the GeoPortals. However, there has been a disconnect between the engineering groups and these mechanisms - project information is not currently available via GIS.
- The GIS Connector project will allow us to take CAD elements, and make them "intelligent" – assign a spatial location and business attributes to them. Anticipate that this will be in production this year (2016). Data will be extracted at the design stage – the designer will place an "as designed" attribute on the elements. Each design group will be able to post data. Once projects are inspected, the attribute status will be changed to "as constructed" and the information will be posted to the geospatial database. Will provide a "license plate" for the element to enable consolidation.
- A group of data stewards got together to come up with a "universal" indexing method for features to enable sharing of attributes across groups for the same feature. The process incorporates "regional data maps" – CAD files with all of the construction project information shown in a single picture. Regional data stewards (to be identified) will manage versions. GIS workbench will be able to connect to the regional data maps and the geospatial database with the extracted and posted features.
- There are further opportunities to re-use information from design. Currently the majority of this information is on contract plan sheets which are archived as PDFs.
    - Environmental staff are scanning the PDFs to TIFFs and placing them in GIS as pictures. Then they extract locations of culverts, catch basins, etc. Finally, they go back to the plan sheets to extract other information – very inefficient.
    - Real Estate Services was taking hard copies of ROW plans (printed from CAD), manually coloring in parcel locations, then scanning them and storing them in an ECM. (This is now being changed so that they are now working with the actual CAD files.)
    - Traffic operations – always looking for current data on traffic assets. GIS Connector will help with this.
- Vision: make sure there are processes available to Environmental, Real Estate Services – need to tailor tools that fit with their skills and functionality. Use Regional Data Maps concept for Traffic, Regional Operations. Tie engineering data to GIS, make it accessible. Pull information about the assets and their work history to inform design.
- There is opportunity to leverage capabilities of ProjectWise (platform on which the GIS Connector and regional maps are based). For example, documents stored for a given project could inherit properties of that project.
- Would like to see WSDOT get to a more enterprise perspective on data sharing and integration solutions. Need to start with an architecture informed by multiple business units and provide an overall structure. (Rather than making it available and letting people figure out how to use it.)
- Need a working group to consider different solutions and implementation methods. This would be different from a high-level governance group – they would be charged with developing specific application guidance, but would need to have management support and backup for recommendations. Key Players would include: Jeff Carpenter (Development), Chris Christopher (Construction), Pasco

Bakotich (Maintenance), Rich Norrel (IT/ECM) – Bill Mumma (Geometrix – ROW.) Would also want to coordinate with Assistant State Design Engineer, Assistant State Construction Engineer.

INFORMATION MANAGEMENT IMPROVEMENT NEEDS AND PRIORITIES

Information Governance

- Need engaged people representing each discipline that can make decisions about standard systems – implement standard approaches to data – across engineering, fiscal, administrative functions.
- Need to identify roles for process improvement and evaluation and get endorsement (from field-level staff up)
- Possibly need for more clarity on data ownership

Enterprise Search and Navigation

- Need for standard location search, spatial views of information
- Federated search (across repositories) based on PIN, WIN, location, program (for financial, programming).

Information Distribution and Dissemination

- Given the large and growing number of information access points, consider implementing a way to personalize an employee's view of information – personal portal, list of favorites, or possibly a customizable dashboard (by discipline).

Metadata and Semantics

- Re-initiate a cross discipline group to discuss common metadata needs and requirements (modeled after a highway features inventory initiative led by Gordon Kennedy)
- Implement metadata features in ProjectWise - have attributes defined but metadata interfaces are not yet built out, need to communicate/sell value to users.
- Standardize metadata across like systems, improve flexibility in entry and search (synonyms, spellings)

Business User Content Creation and Updating

- There are standard folder structures set up within design and construction offices. There are folders for each task/group (with permissions) – use project based access control (in contrast to org-based). A base set of folders is created for all projects– datum and control (grid information), transfer (open to everyone). Then, on request additional standard folders are populated. (Original concept was to use the MDL – but moved to a more concise structure).
- ProjectWise files are all organized by projects, and projects have standard properties (design work order, title, PIN, WIN, SR, begin MP+narrative).
- Need to overcome "file cabinet mindsets" and move towards greater reliance on metadata. The file cabinet/folder approach leads to duplication of information – want to avoid folders based on organization rather than by project (e.g. traffic group working with a region)
- The way access privileges are assigned can inhibit sharing of data across organizational units.
- There are too many competing systems for storing content– need to rationalize what to use when.

- Having multiple systems leads to duplication. For example, ECM provides parallel functionality to ProjectWise. The ROW group requires use of ProjectWise for the CAD files. These CAD files are converted to PDF and stored/shared in ECM.

AREA: DATA MANAGEMENT

Representatives: Gordon Kennedy and Michelle Blake, ITD Data Management; Leni Oman, Knowledge Strategist

INFORMATION NEEDS TO SUPPORT PRACTICAL SOLUTIONS

- Asset information systems are aligned by business areas; currently inconvenient to develop a holistic view. Information may be missing for some assets.
- LiDAR – proposal made, but case needs to be made, need to demonstrate efficiencies.
- Extracting information from CAD drawings represents a big opportunity. These are currently archived, put on the shelf, but could be transformed into a more usable form – GIS, relational database. For example, for developing a stormwater inventory, many features are below ground. This information is assembled by scanning the document of record, redrawing the line work rather than repurposing the original CAD drawing. Will need to address needs for digital signatures to ensure use of authoritative versions. Discussions underway on digital signatures.
- Digitization was done under past Records Manager. Don't have agency-wide repository; but project office repositories. Naming convention and file structures in use inhibit ability to do a federated search across these repositories. People want data, but are getting PDFs with images.
- Plans vault (physical rooms) – store current versions. Also, part of ECM/ILINX. May be licensing issues (past ECM, limited number of seats, lack of clarity on how to access, training not widely oriented.)
- Had a tool to link CAD to the highway location. Issues – descriptions spotty, locations changed. Now looking at GIS connector to ProjectWise (but also need digital signature for this to succeed)-
- Expect things to move to eConstruction (CAD-GIS-Asset Extraction), not sure how long it will take. New workforce will demand this; need to match up with agency-wide governance to make sure it fits together.
- Need for more standardize naming conventions for construction projects —- different documents use different names, makes it difficult to integrate information from disparate systems with their own views. Each region has their own ways of referring to projects; workflow hasn't been standardized which adds to the challenge. Need a way to talk about projects more consistently (WINS, PINS.) Geospatial representations of projects need more thought – they may be represented as point or line features, but are more polygonal in nature; many involve interchanges.
- Version control issues – don't do a good job of purging/archiving older versions of forms.
- Have an asset management team getting together to discuss how decisions about new data collection are made – it is helpful to have these discussions at the business level. Still taking an inventory of our systems; not yet at the point of making the business case and assessing readiness. In exploratory planning phase.
- WSDOT has established processes in place to build new software products. Emphasize needs of the paying business customer over integration. Don't have consistent processes for decisions about data collection.

- Don't have commitment to testing an idea, seeing results before full implementation to guide next steps.
- Several successful examples of information sharing in place:
    - Both GIS and data warehouse are powerful tools – GIS is a good, proven way to share data, meet ad-hoc information needs.
    - SR Viewer tool – good first shot, but people still want to collect or verify information in the field.
    - Most successful: - Data warehouse – impacted all of the business areas (financial), eased workload of financial staff, improved business processes, reduced errors and time delays, has led to more consistent application of business rules. Provides ablity to look at spending, timelines, performance from a whole project life perspective.
    - Highway Activity Tracking System (HATS) – designed to get 2 business units together, has been successful. Due to commitment to work with necessary people (in IT), business analysis, data management needs considered before system design. Very considered approach. Now trying to bring this into Construction. Designed to be extensible; seeing value. Data model supports expansion. Implementing a GIS interface for HATS.
    - TEIS – provides pertinent information on projects programmed and in construction.
    - FIRS (Financial Information Reporting System) – very popular. Still lives – reports on financial transactions.
- Need for more holistic planning – to get best overall outcome, need active engagement involving business, IT, HR, financial at the table.
- There is agreement *within* divisions, but tough to get coherence *across* divisions. People lack awareness of the degree of connectivity across divisions. Strong push by an executive is needed. Need more executive engagement for putting out consistent information to the public while working through risks internally. Definition/interpretation of "enterprise" varies across the organization, which leads to inconsistent application of policies.
- Have struggled to have a consistent, shared vision bought-off on by all participants. Have a mixture of responsible and accountable + support, informed, consulted people – which has been confusing. Need more clarity on "components of the soup".
- Opportunities to support lessons learned:
    - In the LEAN office, they do regular report outs, working with Communications – can this be leveraged? (But Communications typically focuses on meeting external needs)
    - SharePoint sites are the typical mechanism, but need both guidance and audit – otherwise we end up with version control, non-authoritative information, etc. Resourcing issue, need to recognize importance of enabling capabilities.
    - Using Reforms and Initiatives SharePoint Site – includes transition plan, will clarify the communication plan, have a task to flesh out the performance framework.
    - Have an organizational change management person in ASF (Greer).
    - Not enough forums to communicate; even when you do communicate not everyone receives it.
    - Email management needs improvement
    - Division directors are resistant to using SP and other tools – one issue is lack of mobile device support
    - Could do a better job communicating agency issues through twitter and facebook
    - Lack of clarity about which tools are "blessed" – concern about tort claims

    - File sharing not allowed
    - Lack of transparency about process for agency adoption of new tools; testing doesn't involve business enough resulting in decisions that haven't met needs.
    - How can tools such as wikis, SharePoint team sites, Yammer, etc. be better leveraged?
    - Gordon did a survey about cloud services, risks
- Work underway in multidisciplinary engagement groups, LEAN workshop in SW Region on topic or information sharing from maintenance to design.

Information Management Improvement Needs and Priorities

Governance

- Lack of IM policies and standards results in out of date info, unmanaged info, cost to access, people retain their info indefinitely
- Need to complete assessment of policies that already exist, and then develop more unified set.
- Need to separate out best practices and procedures, make them available through easy to access interface – with FAQs, contact person
- Make training mandatory for new employees – link RM and IM training
- Hiring processes – include requirements for computer literacy
- Update "20 questions to ask" when someone wants to initiate a new system (to align with principles)
- Create needs identification and alternative strategies function for the EIGG (i.e. apply the Practical Solutions process steps)
- Discussing domain steward idea (based on MnDOT's model); also having stewards for unstructured information.
- Need for further development/clarification of role for enterprise information management
- No written library policy, no clear guidance for publication of department work
- Barrier is resourcing
- Most important steps:
    - Separate policies from procedures, provide access; Improve ability to search for Executive Orders and Policies (not just by number.) Talk to employees in plain English, provide clear instructions about what they are supposed to do
    - Clearly describe the problem we are trying to solve; work to improve understanding about needs, address "hard boundaries" across communities
    - Provide required training + refresher
    - Need leadership support – intent must be clear to motivate action, consequences need to result from not following policies
    - Establish ownership and authority

Information Creation, Access and Use Management

- Consider adopting a perspective that: "everything is open except for xyz" – the current locked-down model inhibits business access
- File 155 – improve currency of people data
- Improvements to workflow, fragmentation with HR systems – lack of unified strategy across business units

- Increase awareness of what information systems exist and how to get access to systems – without this there are missed opportunities
- Ensure permissions are discontinued when employees are terminated
- Improve procedures and audit functions related to posting information on file shares.
- Most important steps:
    - Collaborative alignment of Records Management and Information Management within the agency
    - Solidifying information about the user base – ensuring timely, accurate information on employees + external consultants.
    - Addressing the file share and SharePoint environment – identify and rectify any issues

Workflow Management

- Very fragmented – need better integration of overall tasks related to data, records and information management – can't see full picture. A dashboard view would be helpful to see what is in the pipeline and what the status is. Hard to synchronize activities without this.
- Could explore use of a business rules engine
- Most important step: Improve awareness of opportunities here.

Data Warehouse and Reporting

- Expand into analytics and visualization capabilities
- Additional spatial data integration – treat GIS as a flavor of BI, more seamless tie
- Most important steps:
    - Dashboards (spatially-enabled)
    - Spatial data integration – seamless way to analyze data

Spatial Data Integration and Access

- Expanded use of ArcGIS online
- DW integration
- Most important steps:
    - GIS connector in ProjectWise to provide better access, get features into SQL databases

Enterprise Search and Navigation

- Need to improve intranet search
- Interested in federated search capability - Integration across repositories (DOTS, Library, intranet, etc.)
- Search application should leverage enterprise taxonomy(ies)
- Auto-categorization (reduce need for manual indexing of documents)
- Need for analysis of existing content – what do we have, when was it last used.
- Most important steps:
    - Categorization strategy – standardization across organization (or among key people)
    - Resourcing for this

Information Distribution and Dissemination

- Open data – delivery of data/content to the public

- Additional APIs
- Automated delivery of agency publications to agency and state library
- More targeted information distribution
- Most important step: distribution of performance management & traffic performance information

Metadata and Semantics

- Communicate distinction between metadata and taxonomy
- Finalize and adopt metadata schemas (FGDC, core, etc.)
- Implement governance to manage metadata schemes
- Integration strategy
    - role of DOTS
    - leveraging metadata in search and navigation
    - integration with content management workflow
    - delivering/sharing data definitions with the data warehouse, COGNOS, other query tools
- Automate categorization – auto population tool
- Most important steps:
    - Vision document to communicate importance to lay people – get more engagement on the part of business units
    - Commitment by business units to provide/create metadata (ensure involvement of SMEs with knowledge of the data)
    - Governance – ownership and change management
    - Actual implementation

Master Data and Controlled Reference Sources

- Master Data: Looking at improvements to the data library – add more elements, add interfaces to applications that are coming up for a maintenance cycle
- Controlled Reference: Shared vision and plan for how we want this to work
- Make the case for resourcing and implementation
- Governance – change management, designation of what is authoritative for different purposes
- Getting to a mode where when people are developing/contributing to shared vocabularies
- Most important steps:
    - Resourcing – currently only have 20% of an FTE for the data library
    - More emphasis on implementing interfaces when there are opportunities
    - For Controlled Reference Sources: Understanding of value provided, hearing a consensus voice across different IM disciplines

AREA: GIS

Representatives: Mark Finch, Alan Smith

INFORMATION NEEDS TO SUPPORT PRACTICAL SOLUTIONS

- Information Sharing

- Biggest success: ArcGIS Online; Vertical Clearance application for oversized loads – received attention from NTSB, legislature, trucking industry.
- Leveraging cloud-based services for sharing data, publishing services – ArcGIS Online.
- For planners, there are two tools - the community planning portal (ArcGIS Online) and the GIS Workbench. Community Planning Portal easier to access but can't do spatial analysis.
- Workbench (extension to ArcGIS desktop) – complex tool; need to find a product that has an easier learning curve.
- Lowest hanging fruit for improvements: modernizing the method used for distributing data – now most data is available as a download in shapefile format from web pages. Newer technologies allow you to automatically add data to map as a service, or download as KML. This is a better way to make data more discoverable, searchable. Already have needed technology, this is easy to accomplish. Would help to improve both internal and external data sharing.
- New types of data are available: solid traffic data from probe (HERE, INRIX, TomTom) – origin-destination, traffic patterns. Currently drive the entire system (2 year cycle) – videolog; add LiDAR along with video – allow business areas to capture assets as data elements from the raw imagery. Signage, Vertical Clearance, guardrail, etc. Just need to get the hardware and storage space. And then figure out how to integrate into our current systems.
- Other data – Real Estate/ROW in GIS. But process is needed to geo-rectify plan sheets.
- Corridor sketch work – planners would like this; maintenance wants it (e.g. they can use to answer questions like: is this billboard in our right of way?).
- Shared data with local agencies: have an All Public Roads (ARNOLD) data set – contact local agencies; ask for their data; incorporate this into our data set. Would like to build an integrated portal. Have talked about working with CRAB – they collect a lot of attributes (roadway geometrics, HPMS, crash) but no geometry. Currently do obtain pavement data from CRAB; incorporate local traffic counts from the CRAB mobility database.
- Have 600+ HPMS count locations; cities have locations too.
- CAE work – biggest benefit would be in keeping road geometric database up to date.
- A lot of data on the plan sheets is created in construction – need field verification.
- Corridor sketch – currently a MS Access database created for regions to populate information about a corridor – data already out of date, not sustainable. Alan is leading an effort to scope an improved tool to help planners. Current database isn't sustainable. There is a difference of opinion about how to address the corridor sketch. To GIS, it seems obvious that a map interface is the right approach. However, starting over, looking from a spatial perspective is a large, unfunded effort. Trying to take available data sets and make sure that planners can access, use them, perform spatial processing. Implement some query capabilities – geoprocessing services (e.g. is there transit within a certain distance, where is the nearest airport) – providing a minimalist approach rather than a wholesale replacement. Being implemented using ArcGIS Server based processes; interface would be Java Script or ArcGIS Online. Most of the data sets they care about are already available as map services. May need to go back to data stewards to add attributes. Have a problem statement – assuming continuation of existing workload, would be 6 months to get something in place..

INFORMATION MANAGEMENT IMPROVEMENT NEEDS AND PRIORITIES

Spatial Data Integration and Access

- Important to allow people ability to search in different ways – some are spatially oriented; others aren't
- Consider COTS products for connecting data warehouse to GIS (haven't researched this lately)
- Currently integrate GIS and Data Warehouse via exports, ETL into data sets in the Workbench; or through map services – but not live, limited flexibility
- Modernizing distribution of data (as discussed above)
- Address LRS – biggest risk – mainframe system from the 1980's, written in COBOL, difficult to maintain. Need to migrate. On critical system list. Could do for 3-400K. Using R&H, will contract out LRS data model TRIPS.
- Most important steps:
    - Modernizing the distribution and publication process. Requires some restructuring of databases. Alan's team stewards 30 different data sets; Environmental Division stewards 20. All data get delivered to a single individual who reviews them and moves them into production – cumbersome process; bottleneck. There is lots of will to improve this. But need to keep lights on, fight fires – limits progress.
    - Opportunity to change business processes - to allow a data steward to update their data, drop into a folder, submit and automatically replicate and put into production, updated map service. Would be less work

Enterprise Search and Navigation

- Need to support people that search spatially and people that don't.
- Have too many mapping experiences – Google, static, etc. need to standardize.
- Best place to find all available GIS data is in the Workbench – but this is the most difficult environment to navigate. Need to standardize and automate data publication, make sure data is getting pushed out.
- Use ArcGIS Catalog, ArcGIS Online – Tools are available, just need to get business process in place.
- Most important step:
    - Automated process for publication

Metadata and Semantics

- Not a big concern
- Used to have at least one GIS person in every region, every business area – now many of these are gone; there are many orphaned data sets not being stewarded, or not by an expert.

Business User Content Creation and Updating

- People are doing publishing within their small groups – not to the public.
- Because GIS data is published through a tool involving restricted access and a degree of training, don't typically run into issues with information organization.

AREA: COMMUNICATIONS

Representatives: Jeremy Bertrand, Kris Rietmann

INFORMATION NEEDS TO SUPPORT PRACTICAL SOLUTIONS

- Data Sharing Examples and Needs:
    - Have 300+ project pages on external web site (projects with community impact) –provide progress updates. But needs improvement in the area of on time, on budget information.
    - Have 3 different info silos for project information: CPDM, Gray Notebook (beige pages), Project web pages – aren't in sync, could be inconsistent.
    - Have over 23K info artifacts linked on external site – challenges managing this, keeping current, authoritative versions.
    - Open Data – have various APIs, but no external concept of searchable data warehouse.
    - Communications has a general need to know what is happening; needs to access information in order to respond to media requests in a timely fashion. Need for understanding about what data are available; need ability to communicate this data (tell the story).
    - Focus is on external agency communications; not resourced for addressing employee communications, Have .5 FTE for maintaining intranet (vs. benchmark value of 6 given size of agency)
    - Migrating the internet web content management system (CMS) to Drupal; issue is updating the content; having the local expertise and time to manage (and clean up) the content. Trying to get an official content manager for each portion of the site. Ownership is sensitive issue. Working with consultant to improve usability. First, trying to make it consistent. (Current system uses 2002 Microsoft CMS)
    - Intend to migrate the intranet to Drupal once internet site is completed.
- Opportunities to support sharing of lessons learned:
    - Barriers include: time to manage/support and concerns about liability
    - Need more guidance on how to share information – what systems to use for different purposes
    - Communications is a user of information; IT would play a role defining the technology; others would be the "herders"

INFORMATION MANAGEMENT IMPROVEMENT NEEDS AND PRIORITIES

Governance

- Too many places to store information; need for more strict policies about where to store; make sure that technologies are current and relevant to the needs.
- Need guidance and oversight
    - people should be linking to content rather than copying it.
    - standard naming conventions (but can't wait for lengthy process to agree on a standard)
- Need to take an inventory of where everything lives – and decide how to winnow it down
- Look at options for sharing information across business units and externally. SharePoint currently set up for team sites, not for statewide access.
- Tradeoffs: security vs. convenience; access by local partners
- Need to make progress on IA, taxonomy, data definitions

- Most important steps:
    - Strengthen EIGG, ensure they are empowered to implement/operationalize governance. Clarify anticipated outcomes

Information Findability and Dissemination

- Currently using USA Search.GOV (BING) – caches everything
- Internal site – using Google Search Appliance (just for intranet – not applications or data – limited crawling scope)
- Need to prioritize investment in search
- Would like to move to Solr
- Need clean up of content
- Need more consistent metadata
- Need more internal training on file naming, metadata, storing docs for findability
- Most important step:
    - Internal education and context setting. "You are part of the problem or solution." (e.g. use of external website for primary information storage)

AREA: LIBRARY

Representatives: Kathy Szolomayer (WSDOT HQ Library) + Christy Grandquist (WSF library and vessel records), Leni Oman, Knowledge Strategist

INFORMATION NEEDS TO SUPPORT PRACTICAL SOLUTIONS

- Making Better Use of Information
    - People need to know how to get to the existing information. When library gets requests, it is not always clear where to look. The data catalog exists but is not exhaustive. Need for better "advertisement" of available information. Also some people may be reticent about sharing their information – perhaps more guidelines about expectations.
    - Need for transparency; currently don't have a way of making the WSF catalog available to the main library. Would be nice to know if the information exists. Trying to get people to send information to the library. Two prongs: knowing what exists, and then finding out who has it, how to make it available.
    - Structured data may be easier to tackle – can improve the DOTS.
    - Greater clarity about what to put where (which repositories) – e.g. WisDOT's data front end, VDOT's corporate docs center. Also, should consider librarian access to ECM given their job functions.
    - WSF library has continuity between records and library. For terminals and vessels, maintain an internal catalog of records (e.g. drawings, calculations), use a shared MARC catalog (different from Innovative – Mandarin system). Did a DSPACE pilot; ran into issues related to storing copyrighted material; needed more IT support. (Wanted to be able to share electronic documents across offices)
- Processes for Collecting New Data

    - Would like to have data management plans for research projects, catalog the data that is collected. Not clear that there are established processes in place.
    - Main library and Materials Library have collection development policies – describe elements of the current collection. Defines responsibility for selecting materials.
    - WSF Library – records component fairly standardized – prescribed by design and construction process (standard workflow defined in the design and construction manual: scoping/preliminary recommendations->designs->contract->change process->as-builts->supplemental construction info->administrative/payment info), rest of collection is "by request" Biggest growth: regulatory-related standards and requirements. (e.g. pollution control). Terminals records: final engineering record + secondary, more detailed version – helpful for reference.) Vessels: changes and admin records handled by construction then provided to library
- Information Sharing
    - Library – web site serves multiple business units.
    - Daily news clips from the library – distributed via email to internal and external subscribers
    - Oracle records – access to as-builts - notifications about where to find.
    - WSDOT twitter feeds – access to info to field staff – check on bridge closures, etc. services that are running late. (consider implementation of an internal-only twitter feed?)
    - Do have Lync and Yammer – but no clear messages about acceptable use.
    - Need: Make the "fishing" process more efficient – a central place to ask the questions. And resourcing this.
- Sharing Lessons Learned
    - Library fields questions about best practices and lessons. Will be hiring a new part time position who will document what they are doing. May be a need to not only document the project, but to also document lessons learned. The existing lessons learned database – highway construction focused, but no Community of Practice, no active champion. Used to do After Action Reviews, stopped doing them (in knowledge interviews, this is one of the most requested things to bring back.)
    - At WSF, Library facilitated contributions to the lessons learned database. Risk management group: must create a lesson learned for every incident. Issue: transparency tool versus internal knowledge sharing. Need to be clear about intent. (Ferry lessons learned were rolled into the main system).
    - Differentiate a "near miss log" as a separate element – e.g. "we were following our standard procedures and X happened."
    - Library at WSF has provided a single source for materials representing all phases of development; this information that has facilitated sharing across the life cycle. Librarians work with planners, designers, inspectors so have the personal contacts.
    - Main library has some historical information but not current.

INFORMATION MANAGEMENT IMPROVEMENT NEEDS AND PRIORITIES

Governance

- Corporate documents center?
- Greater awareness of the value of general solutions (rather than siloed solutions)

- Need for greater appreciation or way to agree on business need to maintain long term access (internal and external) – not always accounted for in the life cycle management process – may want to have copy in library as well as archives. Recognize different life cycles – archives vs. library
- Shared vision for labeling/classifying information
- Need enterprise-level understanding of business activities (rather than organizational unit based)
- More of service orientation – helping to preserve, create clarity
- Clarify: if it is a WSDOT publication it should be in the WSDOT library – something can be both a publication and a record.
- Need for guidance on when/how to allow use of WSDOT materials
- Most important steps:
    - Getting buy-in. Have a lot in place but still feel that there is a lot more to do – evangelizing, management appreciation of importance of info assets, recognize liabilities/risk, inefficiencies.
    - More transparency about whether we are hitting our mark – performance reporting on this.
    - Improved partnership with records

Search and Navigation

- Would like to explore alternative to *Innovative* (state library system) – but funding has been an issue.
- Common language/taxonomy, structure for integrating and managing it (by people who understand purpose and how to do it well.)
- Possibly share MARC records from WSF with main library (as appropriate)
- Can export subject headings and name and org authorities from OCLC; Generate a list of resource types (MARC element)
- Practice of following up on search log findings.
- Most important step:
    - Common vision about taxonomy, metadata and strategy to apply – to make headway on improvement of intranet search

Distribution/Dissemination

- Some opportunity to improve distribution of agency publications – more consistent process for people to sign up
- WSF working on system-wide dashboard – one stop state of the system resource for managers – terminal and vessel maintenance status, crewing, seasonal changes (single dashboard).

AREA: RECORDS MANAGEMENT

Representatives: Kara Larsen and Jamey Taylor

INFORMATION NEEDS TO SUPPORT PRACTICAL SOLUTIONS

- Not covered

INFORMATION MANAGEMENT IMPROVEMENT NEEDS AND PRIORITIES

Governance

- Response to FOIA is a big concern, and a key driver of the RM efforts - very labor intensive, employees control much of the records; not in ECMs – records stored in paper and electronically in various places, need to rely on employees; level of confidence is problematic.
- Vision: not (yet) in a position to implement ECM holistically; meanwhile rolling out RM program – one Bus unit at a time. ID workflow, then implement consistent file management, then training – on WS retention schedules.
- Most important steps:
    - Training – increasing awareness of what public records are and what employees' obligations are
    - Redrafting EIGG policy to give group more authority; working on a RM policy to potentially incorporate some of the more specific policies, consolidate existing policies.
    - Online tutorial through Learning Management System (LMS) for RM – but starting with in person training (adding records and public disclosure as part of new employee orientation)

Records Management Execution

- Agencies are require to follow the general state Records Retention Schedules. These have just been updated; now need to crosswalk prior schedule;
- Agency-specific schedules must be approved by Secretary of State; any new schedules established by WSDOT to meet unique agency needs (e.g. ROW plans) will require this approval.
- Looking at solutions for archiving emails – statewide IT agency
- Issue: need to retain physical custody of records (can't use cloud)
- Would like ECM to be agency-wide, include RM capabilities. (DOD compliance is a potential issue with ILINX .) Alaska Way Viaduct product (OpenText) is being used in a manner more consistent with RM practices.
- Most important step:
    - Complete business units with highest priority – starting with OEO, AWV Project, Tolling (estimated 1 year to go through whole Department)

Information Access and Use Management

- Would like new EIGG to consider some policy changes regarding ownership of rights to access information; currently within purview of business unit to establish access rights
- Need for common understanding of metadata (there is legal definition under case law in WA) – also reference to "indexing" of records.

Data Integration and Reporting

- Desire to avoid duplication, improve data sharing – need to recognize that individual business units don't own the data, overcome/address fear of misuse
- Recognize that some data needs to be protected.
- Most important step: Addressing the silo culture – the One DOT initiative

Findability and Dissemination

- Consistency in file structures, use of ECM

- Keyword search yields large volume of records to manually review and redact – need to improve precision

Business User Content Creation and Updating

- Try to get people to not retain what they don't need to (training about what is transitory; what makes you a record owner) – ensure that people understand what they can legally discard.

AREA: INFORMATION TECHNOLOGY

Representatives: Grant Rodeheaver (CIO), Larry Gruginski (Application Development), Tom Westfall (ECM Taxonomy), Gary Brown (Business Analysis, Application Design)

INFORMATION NEEDS TO SUPPORT PRACTICAL SOLUTIONS

- Making Better Use of Information
    - Some evidence that there may be unnecessary rework – e.g. project offices want to collect new data when existing survey data exists; but there are often legitimate reasons for this – e.g. existing data too old; may no longer be accurate.
    - May be examples where making data accessible on a single platform could help.
    - However, issue is not always that people are unaware that the data exists; more a question of trust in the data if they didn't create it themselves.
    - Need to make sure that new data collected provide additional value.
    - Direction on this needs to come from the business side at WSDOT
- Information Sharing
    - Several existing systems are in place and well utilized: Data warehouse, EFRS (accounting information), HATS – good example of using and updating information in an enterprise environment.
    - IT doesn't hear needs from users about information sharing needs, but suspect that there is a need for better sharing across the life cycle – info gets moved from "box to box". Likely opportunity to improve this process, reduce rework.
    - Sometimes there is too much data out there – hard to process; may be multiple versions as well
- Sharing Lessons Learned
    - Great utility – but challenge is getting people to engage consistently. May need better executive buy-in. Need to be more deliberate, leverage communication channels, talk about it at the start and end of project.
    - Do use SharePoint Team Sites, have tried Yammer. Efforts have been team-specific, not enterprise-wide. Who decides? What is the strategy? Haven't resourced this. Haven't settled on a solution. May be some records retention issues (transitory vs. basis of decisions).
    - Some of the megaprojects manage their information independently – how does this help us enterprise-wide? May be an opportunity to learn from these examples.

INFORMATION MANAGEMENT IMPROVEMENT NEEDS AND PRIORITIES

Governance

- Records Management group working to develop training – for both IT staff and other agency staff - one of bigger challenges is education; also need to work on storage locations, archiving, newer technologies

- Reconciling agency and statewide policies –for use of cloud services and other hosted solutions
- WSDOT managing more and more electronically – need to better understand authoritative sources, official copies
- IT governance: moving target - trying to align with OCIO changing needs.
- Critical applications have been identified, but not addressed – in survival mode (keeping lights on)
- Most important steps:
    - Shared vision with executive team, common understanding of the critical nature of our systems and a vision for where we are going…
    - Barriers: resourcing – only including "catch-up" items in budgets – governance body should be prioritizing
    - Emergent issues like PCI (payment card industry compliance) has consumed attention/resources

User Access Management and Security

- Looking at SAW (Secure Access Washington) – way to integrate with central state system.
- Payment Card Industry
- Unstructured information is biggest gap
- Records training to cover PII, security classifications.
- Most important step:
    - In general – identity management, ability to federate, manage access to other entities (FHWA, other agencies, etc.)

Workflow Management

- Challenge – have 3-4 enterprise content management solutions, using each a bit differently
- Leveraging ILINX for workflow development
- Digital signatures – big opportunity
- Most important steps:
    - Identity management & digital signatures

Data Integration and Reporting

- Dashboarding, visualization
- Some amount of "desktop database" (Access, Filemaker Pro) development going on
- Some interest in looking at big data platforms
- Increasing need to look at structured and unstructured data in an integrated way
- Most important steps:
    - Improved infrastructure supporting data warehouse – more resilient environment, increase staffing levels give size of program (at 25% of what we should have)
    - Better disaster recovery

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